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Harvesting, Drying and Storing Grain Sorghum

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Harvesting

HARVEST CONDITIONS

Grain sorghum is physiologically mature when moisture content drops to about 30%. At moistures higher than 25%, however, the seeds are too soft to withstand adequate threshing action, leading to either unthreshed heads or cracked seeds.

Sorghum dries rapidly in the Great Plains, often down to the 12% moisture level needed for safe storage. But, because of the danger of shatter loss and lodging from wind and rainstorms when moisture is under 20%, many western operators prefer to harvest early (20-25%) and dry artificially.

Early harvesting is also advisable in Indiana, but for a different reason. Our more humid conditions delay field drying and encourage mold development, even though shattering and lodging would be less likely than in the west.

COMBINE HEADS AND GATHERING UNITS

Grain sorghum, if it is standing, can be combined with a regular grain header. It should be cut as high as possible without skipping too many heads. Cutter bar guard extensions are helpful if heads droop.

As with soybeans, reel bat speed should be only about 25% faster than ground speed to avoid shatter losses. The reel should be set high enough to avoid catching under the heads and throwing them over. Wider reel bats may be needed to prevent this.

Gathering losses in a standing crop are usually less at 2.5 to 3 mph, but this speed may overload the rack and shoe. In such a case, it is best to maintain this optimum speed but take a partial swath to prevent overloading.

If lodging is a problem, consider a row-crop attachment to help pick-up and intake of the crop. These fit in front of the grain header cutter bar and have gathering points, gathering chains and kicker wheels, somewhat like a forage harvester head. Vertical finger cylinders and spiral gathering cones are also used in row-crop attachments. Also, lodging is less severe at row spacings of 30 inches or less than at 38 to 40 inches, because adjacent plants are more likely to support the heads of broken stalks and keep them from settling to the ground.

THRESHING -- CYLINDER AND CONCAVE ADJUSTMENTS

Threshing action should be only enough to detach the seed from the heads. Cylinder speed is lower than for wheat, and some of the concave bars can sometimes be removed. Concave clearance should be about 1/2 inch in front and 1/8-3/16 inch at the rear in most cases. Follow your combine's instruction manual. Worn cylinder or concave bars allowing excessive clearance at the center of the cylinder should be replaced.

Sorghum stems often catch and choke the straw walkers, causing inconvenience and lost time in cleaning. Straw walker covers, which contain smaller holes to stop the stems but still pass the grain, are available for most combines.

Grain sorghum stalks are smaller and much wetter at harvest than corn stalks and are more likely to be chopped up and delivered into the grain tank. Pieces of stalk returned to the cylinder in the tailings will be chopped even finer. Therefore, keep the chaffer extension closed enough to prevent this, even at the expense of losing some grain. in fact, you may want to cover the chaffer extension with sheet metal to keep stalks out of the return.

Inspect the sieves often during the harvest operation to detect matting, since this will lead to excessive grain loss. The upper sieve should be set 1/2-2/3 open and the lower sieve 1/3-1/2 open. They should have just enough air to keep the layer 1alive and floating and not be overloaded by too high a ground speed.

MEASURING FIELD LOSSES

Combining field losses of grain sorghum can be checked by the following. procedure.(This procedure is similar to that for soybeans described in "A Guide for Measuring Soybean Losses," by D. M. Byg, Ohio State Extension Agricultural Engineer. To obtain a copy, contact your local county Extension Office.)

1. Determine total loss by counting kernels in a 10 square foot area over the width of cut behind the machine. Approximately 17 kernels per square foot represents a loss of 1 bushel per acre.

2. Determine pre-harvest loss by counting kernels on a 10 square foot area before the combine enters it.

3. Determine gathering unit loss by backing the machine several feet and counting the kernels on a 10 square foot area across the width of cut in the stubble ahead of the cutter bar and subtracting the pre-harvest loss.

4. Determine threshing and separation loss by subtracting pre-harvest and gathering unit losses from the total loss. (This procedure is similar to that for soybeans described in "A Guide for Measuring Soybean

Losses," by D. M. Byg, Ohio State Extension Agricultural Engineer. To obtain a copy, contact your local county Extension Office.)

If gathering unit losses exceed 8%, or threshing and separation losses exceed 2%, changes in adjustments and/or operating techniques should be made in an effort to reduce losses.

Drying

REMOVING TRASH

Trash is a more severe problem in drying sorghum than in drying corn because the' plant does not die until frost-killed. If sorghum is harvested before frost, there may be many pieces of green stems and leaves to contend with. In the dryer, this trash tends to float and collect in corners, thus causing a potential fire hazard and modifying air flow. Small pieces usually present more resistance to air flow and larger pieces, less resistance.

Cleaning sorghum may be desirable both before and after drying. Removing trash before the drying process will decrease the load on the dryer and allow for more uniform drying. However, "wet side" cleaning is difficult because the grain tends to be wet and sticky from the stem juices released during combining.

Cleaning sorghum is primarily a scalping operation to sieve out the large particles and trash rather than sifting out the fines from the seeds. If you use rotary screens, remember that the grain falls through the screen and the trash is retained. Since most cleaners are designed to retain the grain and drop the fines, you may need to re-orient the take-away conveyors to handle the large volume that falls through the screen.

AIR FLOW CHARACTERISTICS

Since sorghum seeds are smaller than corn kernels, there is less space between them and, therefore, more resistance to air flow. At an air flow rate of 10 cubic feet per minute per bushel (cfm/bu), a 3-foot depth of sorghum has as much resistance as a 4-foot depth of corn (Table 1).

Table 1. Static Pressure for Various Depths of Corn and Sorghum with 10 cfm/bu Air Flow[a]

Grain depth	Resistance to air flow	
	Corn	Sorghum
feet	inches of water	
2	0.55	0.95
2-1/2	0.8	1.65
3	1.25	2.6
3-1/2	1.7	4.0
4	2.8	

[a] From mimeograph developed by H. Hamilton, Kentucky Agricultural Engineer. Values derived from Shedd's Data x 1.55 to compensate for compaction and entrance losses.

Table 1 should not be interpreted to mean that you cannot dry sorghum at depths greater than 4 feet. Resistance to air flow depends on how much air you are forcing through the openings around the kernels or grains. By reducing air flow rates to 3-5 cfm/bu (typical for deep bin drying), resistance (static pressure) will likewise be reduced.

DRYING AND COOLING RATES

An individual sorghum seed exposed to air flow will dry faster than a kernel of corn because it is smaller and the interior moisture can get out faster. But the greater flow resistance of a layer of sorghum in a bin reduces the quantity of air flow for a given static pressure. As a result, both the drying and cooling rates will be 2/3 to 3/4 that of corn for the same moisture content and drying equipment.

FIRE RISK

Reports indicate that incidence of fire is greater when drying sorghum than when drying corn. One reason is that there is usually more trash with sorghum grain that can accumulate in pockets which stay in the dryer or block grain flow. Since this trash dries faster than the grain and may remain through several drying cycles, it can easily reach "tinder condition. Another reason for dryer fires is that an inexperienced operator, in order to compensate for sorghum's slower drying rate, may increase the heat to hasten the drying process.

To minimize fire risk from igniting trash, the dryer, especially flow-through types such as batch or continuous flow units, should be inspected (at least once a day) to make sure all pockets of material are unloading. Continuous flow dryers may have to be emptied daily to permit inspection. DO NOT leave fully automatic dryers running unattended for long periods of time. In fact, closely supervise all drying processes, especially if this is your first experience with sorghum drying.

Fuzz and fibrous dust tends to accumulate around and on motors, controls and equipment. This material collects moisture and can short-circuit motors and controls, or it may be ignited from normal arcing of the electric current when contacts open and close. Therefore, clean daily (preferably with compressed air) any dust accumulation on (a) end bell housings on open electric motors, (b) switch and control boxes, and (c) air intake screens on motors, radiators, filters and fans.

Many dryer fires apparently result from trash which is sucked into the intake, through the flame, then deposited, still glowing, in the plenum chamber and possibly in the grain mass. To prevent this, try to keep the ground clean around the air intake.

The intake may also be shielded to reduce ground pick-up. But remember, (1) do not restrict air flow by too fine a screen (1/4-inch mesh is adequate), by reduced intake area or by sharp corners; (2) arrange the screen so that leaves and trash will drop away without blocking the air intake; and (3) be careful that overhead intakes do not pull in trash carried by wind gusts.

Recognize that trash can sift through and blow under false floors in bin dryers, making fire-hazard as great as with flow-through dryers. The low-air intake position of bin dryers presents an added trash pick-up hazard.

DRYING PROCEDURES

Any drying method used for shelled corn should also work for sorghum, subject to the limitations of lower air flow and, hence, capacity. Bin drying should be similar to corn if drying depths and layers are reduced 25 to 40%.

Corn and sorghum can be layered or mixed if the grain is to be used for livestock feed. Either can be placed on the bottom, but the overall-depth or layer thickness should be reduced to compensate for the added flow resistance of the sorghum portion of the total.

Drying air temperatures are essentially the same for sorghum as for corn, i.e.:

1. 110°F maximum for grain to be used for seed.

2. 120°-140°F for non-stirred batch-in-bin feed-grain installations using air flows of 10-25 cfm/bu for 2-1/2 to 4-foot depths.

3. 160°-200°F for feed grain in batch or continuous flow installations using air flows of 100-200 cfm/bu.

4. Add 10°-20°F to outside air for deep layer drying with supplemental heat with timer or humidistat heat input control.

Procedures used for dryeration, grain stirring and blending can be the same as for corn if allowance is made for the increased air flow resistance of sorghum.

WET-HOLDING

Wet sorghum cannot be held as long as corn before spoiling and sprouting, although farmer experience in Indiana indicates that holding overnight is not as-dangerous-as we previously thought. The sorghum mass packs tighter, inhibiting air circulation, and thus the seeds are apparently quicker to germinate.

Present recommendations regarding holding wet sorghum are as follows:

1. Be very cautious about holding for more than one day ahead of the dryer, especially in your first year of experience Also, be sure that all wet grain has been removed from the holding bin before refilling.

2. Recognize that-conditions of 23-25% moisture and 80°-90°F grain;temperatures are ideal for heating, mold and sprouting. Safety margins are very narrow.

3. Consider adding aeration of 1/2 cfm/bu to the wet holding tank. If nighttime temperatures drop 10°-20°F below daytime averages, aeration will be very beneficial. If they do not drop, however, very little cooling results other than that due to evaporation of grain moisture into the flowing air.

Storage

Wet sorghum can be ensiled like wet shelled corn. It is important, however, to get the grain under cover and sealed quickly than to compact it. Grinding or rolling prior to storage is popular (although not essential) because it aids air exclusion and is desirable prior to feeding.

Dry sorghum stores essentially the same as shelled corn. As mentioned above, it should be cleaned before storing. In addition, it should be mechanically spread or filled to distribute the fines and trash or the center withdrawn after filling to remove any concentration of fines.

A properly designed aeration system is essential for safe storage. Here are major considerations in the operation of such a system:

1. Use 1/10 cfm/bu air flow.

2. Cooling is the first consideration with humidity and moisture control secondary. Run the fan, regardless of weather conditions, whenever the grain is heating or over 22% moisture content.

3. When the grain is below 22% moisture and not heating, run the fan whenever the outside air is 10°F cooler than the grain mass until the grain is cooled down to 40°-50°F.

4. The increased air flow resistance of grain sorghum reduces aeration flow rates compared to corn. This may not be as critical as in drying, however, because of the low air flow rates and the greater latitude in aeration.

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