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Reduce Shatter Losses in Your Grain Sorghum Harvest

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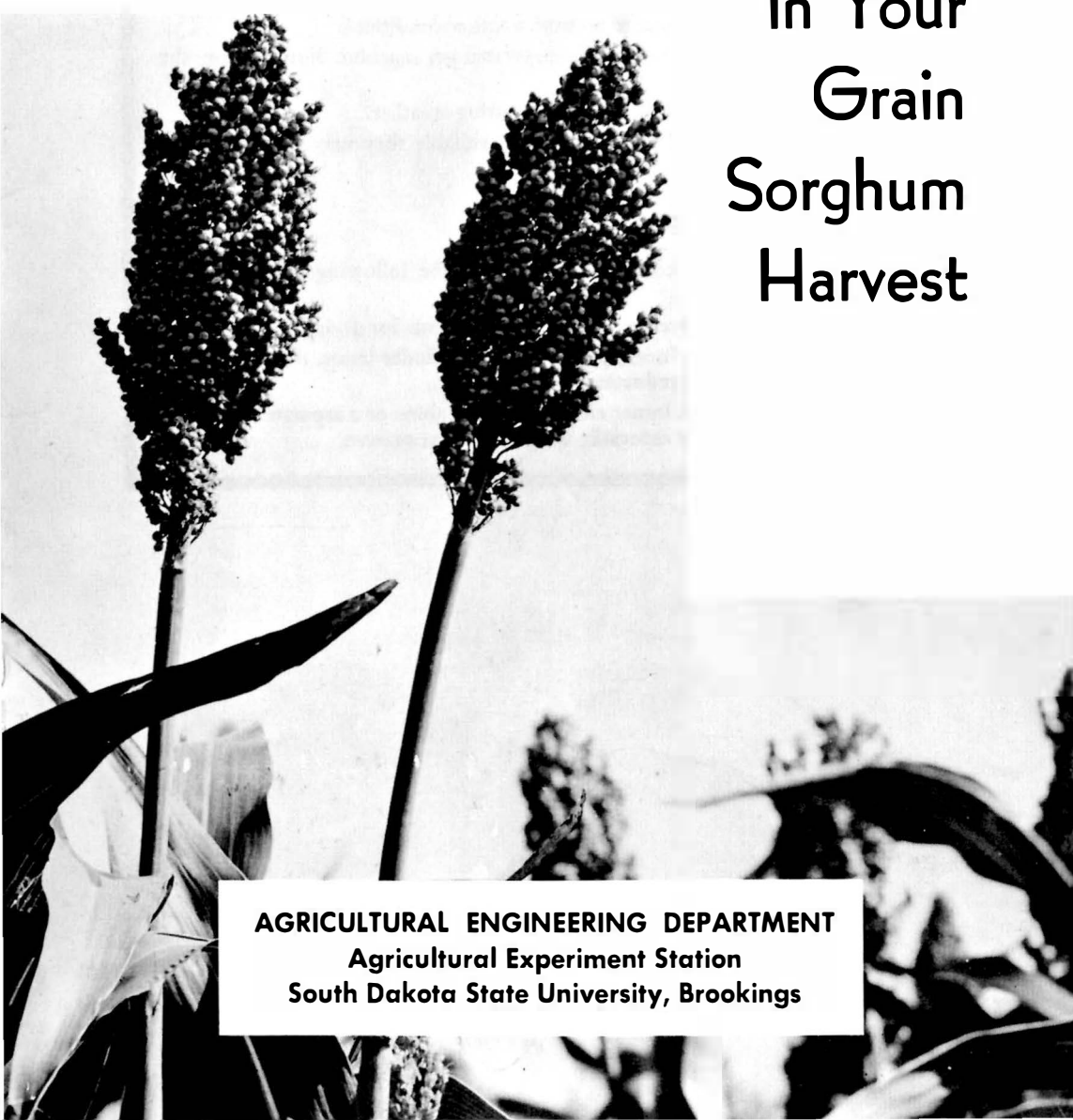
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Reduce SHATTER LOSSES

in Your
Grain
Sorghum
Harvest



AGRICULTURAL ENGINEERING DEPARTMENT
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ADVANTAGES

High moisture combining of normally matured grain sorghum will offer the following possible advantages:

1. Reduce losses due to adverse weather conditions.
2. Increase the acreage to be harvested per machine thus reducing the machine cost.
3. Better utilization of good harvesting weather.
4. If drying facilities are already available they may be used to advantage.

DISADVANTAGES

High moisture combining will cause the following possible disadvantages:

1. Need for a dryer or making arrangements for drying.
2. Increasing cylinder speed to reduce cylinder losses, therefore, more crackage and reduction in germination.
3. Need for a recleaner either on the combine or a separate unit to facilitate drying especially when weeds are present.

Reduce Shatter Losses in Your Grain Sorghum Harvest

By HENRY WAELTI,
assistant professor of agricultural
engineering

Earlier harvesting of grain sorghum when its moisture content is high (above 16%) helps reduce shatter losses, initial investigations have shown.

Heavy field losses, some caused by shattering; are one reason grain sorghum production dropped temporarily in the early 1960s. Most of the losses occurred at the beginning of the harvest season and were caused by stormy weather, particularly high winds.

Since sorghum is more resistant to corn rootworm and drought than corn, it probably will continue to be grown on even a larger acreage in South Dakota in the future. About 200,000 acres were harvested in 1964.

OBJECTIVE OF INVESTIGATION

In the fall of 1964 a study was made to determine the feasibility of harvesting sorghum at high mois-

ture content. Objectives of the study were to determine:

1. The magnitude of the different losses during combining.
2. The effect of date of harvest (moisture content of grain) on losses.
3. The feasibility of harvesting sorghum at high moisture content.

HARVESTING CONDITIONS

The main emphasis was to determine the effect of the season on harvesting and losses.

Several times during the harvesting period the moisture content of the grain was determined. Figure 1 shows how the moisture content decreased through the season.

CROP AND MACHINERY DATA

Sokota 503 grain sorghum was planted May 20, 1964 in 40-inch rows. The crop was irrigated by sprinklers several times during the

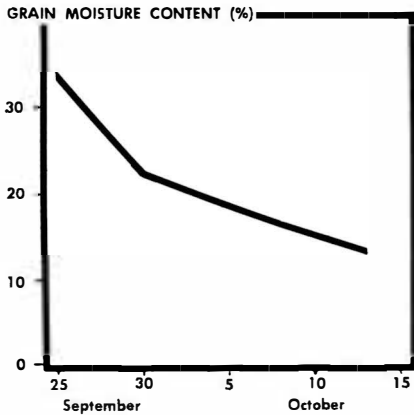


Figure 1. Relationship between date in season and moisture content of grain.

growing season. Harvesting began September 25. At that time stalks and leaves were still green and the moisture content of the grain was 33.6%. A John Deere 45 combine with a 4-bar reel and grain header was used. No special attachments except long cutterbar fingers were used. Cylinder r.p.m. was 780 for all tests and cylinder-concave clearance was set at $\frac{3}{8}$ inches for front and $\frac{5}{16}$ inches for rear and was also held constant for all tests. Sieve setting was adjusted for best performance for each test, however, very little change was necessary from one test to the other.

FIELD DETERMINATION OF LOSSES

Shattering losses due to wind prior to harvesting were determined before each test by random placement (three times) of a 40x40-inch wood frame on the ground adjacent to the test area. All grain on the ground within the frame was collected and weighed for field shatter loss determination.

A canvas was used to collect all discharge from the combine rack and shoe over a test area of 500 square feet. The machine was operated until loads were stabilized before collection began. Discharges collected were processed in the laboratory. All loose grain in the sample represented rack and shoe losses, and unthreshed grains represented cylinder loss.

Gathering losses were determined in the area where the discharge was collected. In three 40x40-inch areas all grain on the ground was collected and weighed. These samples represented field shatter and cutterbar shatter losses. The cutterbar shatter losses were obtained by subtracting the field shatter losses which were determined before field operation began.

Reel loss consisted of heads not cut or thrown on the ground by the reel. These heads were collected from the 500-square-foot test area, threshed, and the grain weighed.

LABORATORY DETERMINATION

Grain moisture was determined by the oven drying and weight method.

Random samples of grain collected from the combine bulk-tank and also hand threshed heads were used to determine grain crackage.

Both visible and invisible grain damage were determined. Three samples of 100 grains of hand harvested and machine harvested grain were used. Broken kernels or visible cracked kernels made up visible damage. Invisible cracks were determined with a dye technique developed by the Plant Pathology De-

partment. These invisible cracks are large enough to allow fungi to enter the seed and destroy seed tissue, thus reduce germination in seed grain or reduce storability of feed grain.

RESULTS

Table 1 shows the effect of harvesting date (or grain moisture content) on combining losses and table 2 shows the effect of harvesting date on seed crackage.

The combine setting was the same for all tests:

Cylinder speed.....780 rpm
 Cylinder-concave clearance
 (front).....% in.
 Cylinder-concave clearance
 (rear).....5/16 in.
 Forward speed.....2 mph

DISCUSSION OF RESULTS

Figure 2 shows the losses that occurred during the different harvesting periods.

The preharvest (field shattering) losses were negligible during the early part of the season and later, as the plants matured, increased to 2.2 bushels per acre. The increased loss during the latter part of the season was due to high winds prevailing for that period.

The cutterbar losses, and separating and shoe losses remained about the same during the overall harvesting period.

The cylinder losses were high during the first part of the season with high moisture grain. It decreased from 3.7 bushels an acre at

Table 1. Grain Losses in Bu/Acre for Different Harvesting Dates. (All weights are adjusted to a 12% moisture content; Yield=76.9 Bu/Acre)

Loss	Harvesting Date			
	Sept. 25	Sept. 30	Oct. 8	Oct. 13
Moisture content, %	33.6	22.1	16.6	13.0
Field shatter loss, bu/ac1	.1	2.2	2.2
Cutterbar loss, bu/ac	1.0	1.9	1.5	1.5
Reel loss, bu/ac	1.8	4.0	3.3	4.0
Cylinder loss, bu/ac	3.7	1.9	.9	.8
Shoe loss, bu/ac	1.0	.3	.6	.6
Total loss, bu/ac	7.6	8.2	8.5	9.1

Table 2. Seed Crackage for Different Harvesting Dates

	Sept. 25	Sept. 30	Oct. 8	Oct. 13
Moisture content of grain, %	33.6	22.1	16.6	13.0
Visible cracks in grain from tank, %	6	5	6	7
Hairline cracks in grain from tank, %	8	22	12	15
Visible cracks in hand threshed sample, %	0	0	0	0
Hairline cracks in hand threshed sample, %	8	18	8	12
% Total crackage of machine harvested samples	14	27	18	22
% Total crackage of hand threshed samples	8	18	8	12
% Seed damage due to harvesting	6	9	10	10

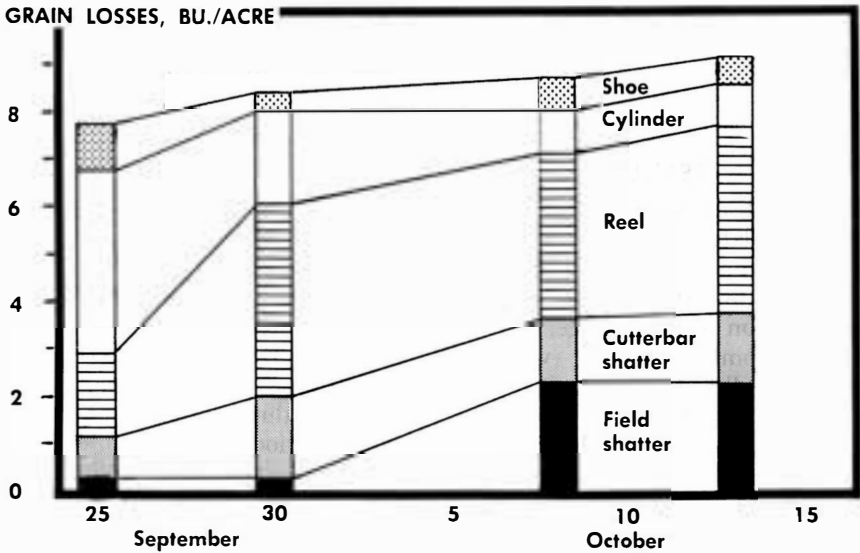


Figure 2. Relationship between date of harvest and harvesting losses.

the beginning of the season to 0.8 bushels an acre during the latter part of the season. The losses could probably have been reduced at first by increasing the cylinder speed of the combine, however, in that case crackage of the grain would have increased.

The reel loses were 2-4 bushels an acre through the season and represented the highest single loss. Part of these high losses could probably have been prevented by using a larger reel with more than four bars. The small four-bar reel that was used was not satisfactory for harvesting sorghum. If the reel losses could be reduced substantially by using a special reel, great savings could be obtained especially on large acreages. Part of the rea-

son for the high reel loss was corn borer damage. Most stalks broke at places damaged by corn borers.

Table 2 indicates that grain moisture content was not a significant factor affecting grain damage. Previous tests have shown that cylinder speed is probably the most important factor affecting grain damage.

FEASIBILITY OF HIGH-MOISTURE CONTENT HARVESTING

The results represent only one season and one machine. However, they indicate that it is possible to combine sorghum grain at high moisture content, 20% or higher, without substantially increasing harvesting losses or increasing crackage damage. If the grain is above 14%-16% moisture content,

some means of drying the grain must be provided. If the grain is to be dried it may be necessary to run

it over a cleaner because trash and broken seeds restrict the flow of air through the drying grain.

Use of a trade name does not imply endorsement of one brand over another.

