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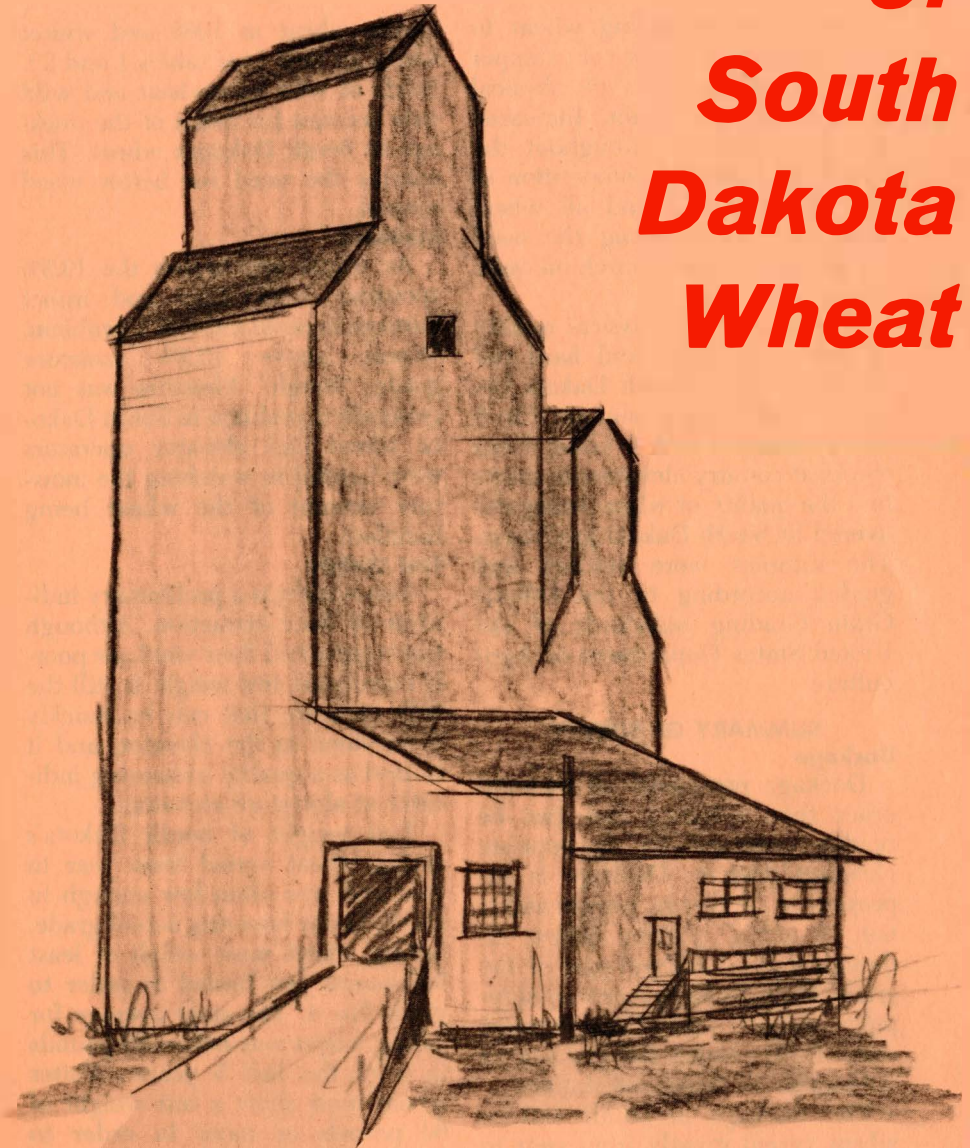
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Physical Quality of South Dakota Wheat



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Physical Quality of South Dakota Wheat

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The producer selling wheat to the country elevator or shipper does so on the basis of physical quality of the grain. Increased wheat production throughout the world has stiffened competition in the wheat market and all wheat producers are realizing the need for keeping a closer watch on quality.

A study¹ of the physical quality of hard red winter and hard red spring wheat in South Dakota began in 1963. Each summer for 5 years, samples were taken from trucks at country elevators to ascertain the quality of wheat being delivered by South Dakota producers. The samples were studied and graded according to the Official Grain Grading Standards of the United States Department of Agriculture.

SUMMARY OF SURVEY

Dockage

Dockage represents all material other than wheat that can be readily removed by appropriate cleaning devices. Dockage is expressed as percent by weight and is not an actual grading factor, although it is an integral part of the grade. High dockage increases shipping weight and transportation costs. It also makes the grain more vulnerable to insect infestation.

The dockage in South Dakota wheat varied greatly from year to year, but tended to be high, particularly in the spring wheat. (Dockage above 1% is often considered high.) Stem rust epidemics tended to increase dockage—for example,

spring wheat in 1963 and winter wheat in 1965 (see tables 1 and 2). Seeds of wild buckwheat and wild oats account for much of the dockage in South Dakota's wheat. This reflects the need for better weed control.

Moisture

As wheat approaches the 13.5% moisture level, heat and insect damage become more of a problem. Wheat above 13.5% moisture grades "tough." Moisture was not generally a problem in South Dakota wheat and elevator operators were careful in watching the moisture content of the wheat being handled.

Test Weight

Test weight is a preliminary indicator of flour extraction. Although test weight and flour yield are poorly correlated, test weight is still the only measure that can be quickly determined in the elevator, and it is used as a quality measuring indicator at almost all elevators.

Test weight of South Dakota's spring wheat varied from year to year and was often low enough to be the factor lowering actual grade. Spring wheat must weigh at least 58 pounds per bushel in order to grade No. 1. The state average for spring wheat was below 58 pounds in 4 of the last 5 years. Winter wheat must show a test weight of 60 pounds or more in order to grade No. 1. South Dakota's winter wheat met this requirement in 4 of

¹The study was a cooperative endeavor by the South Dakota Wheat Commission and the Agronomy Department of South Dakota State University.

Table 1. State averages of seven quality factors of spring and winter wheat in South Dakota

FACTORS	YEAR				
	SPRING WHEAT				
	1963	1964	1965	1966	1967
Number of Samples	485	483	340	113	268
Dockage (%)	4.14	3.82	2.15	4.67	1.71
Moisture (%)	12.5	11.4	11.2	11.7	11.5
Test Weight (lbs/bu)	55.5	57.5	57.5	55.5	60.0
Foreign Materials (%)	0.39	0.30	0.52	0.48	0.42
Shrunken and Broken (%)	1.41	3.83	2.29	2.26	3.10
Total Defects (%)		4.20	2.92	2.86	3.64
Protein (%)			13.57	16.44	13.29

FACTORS	YEAR				
	WINTER WHEAT				
	1963	1964	1965	1966	1967
Number of Samples	230	288	179	186	248
Dockage (%)	2.84	1.52	3.90	1.22	0.72
Moisture (%)	12.4	11.4	12.0	10.6	11.3
Test Weight (lbs/bu)	60.5	61.7	56.0	61.7	62.5
Foreign Materials (%)	0.46	0.37	0.65	0.12	0.32
Shrunken and Broken (%)	1.31	2.37	3.37	0.83	2.2
Total Defects (%)		2.68	4.19	1.01	2.75
Protein (%)			10.69	14.69	12.77

the last 5 years. The stem rust epidemics referred to earlier were seen to seriously affect test weight.

Damaged Kernels

Damaged kernels are composed primarily of sprouted kernels, fungus-damaged kernels, insect-bored kernels and immature green-colored kernels. Neither damaged kernels nor heat-damaged kernels were found to affect the grade of South Dakota wheat except for such a small number of samples that they could not be readily shown in a summary table.

Foreign Material

Foreign material represents all material other than wheat that cannot be removed by normal cleaning devices. Foreign material in South Dakota's wheat was composed largely of seed of wild buckwheat and wild oats, although rye was found in a few samples of winter wheat. Foreign material content varied from year to year, but generally stayed below the limits for No. 1 wheat—.5% by weight.

Shrunken and Broken

The factor that determined grade most often in South Dakota wheat

Table 2. South Dakota wheat samples classified according to subclass (in percent).

Subclass	1963	1964	1965	1966	1967
Hard Red Spring Wheat					
Dark Northern					
Spring	40	74	85	79	96
Northern Spring	26	16	11	15	4
Red Spring	34	10	4	6	0
Hard Red Winter Wheat					
Dark					
Hard Winter..	59	72	49	95	78
Hard Winter	28	21	30	4	19
Yellow Hard					
Winter	13	7	21	1	3

was shrunken and broken kernels. Up to 3% by weight is permitted before grade is lowered. The percent of shrunken and broken kernels varied considerably from year to year. Shrunken kernels are the result of hot, dry weather during the filling period or of premature ripening because of stem and foliage diseases. Broken kernels are the result of improper setting of the combine.

Total Defects

Total defects is determined by adding together the three grading

factors: (1) damage, (2) foreign material, and (3) shrunken and broken kernels. Total defects is a relatively new grading factor. It has improved the reporting of grain quality by forcing borderline samples of the above factors into the next lower grade. This improves the descriptiveness of the grade. In 1967 total defects was the factor that determined grade in 20% of the samples not grading No. 1.

Protein

While protein is not a physical quality factor of wheat, it was determined for all samples in 3 of 5 years of the study. It is an indicator to the buyer of the probable baking performance of the wheat. Protein content varied greatly from year to year.

Contrasting Classes

Contrasting classes refers to the mixing of another use class of wheat with the class being graded. Durum is a contrasting class in the bread wheat classes. Over the 5-year average, only 2% of the spring wheat contained contrasting classes in sufficient amounts to affect grade. No contrasting classes were found in the winter wheat.

Subclass

Subclass is an indicator of the percentage of dark, hard and vitreous kernels. Wheat subject to high moisture at maturity or grown on land low in available nitrogen will often have a low percentage of dark, hard and vitreous kernels. Dark Northern Spring, Northern Spring and Dark Hard Winter and Hard Winter are generally used by the millers for the production of bread

flour, whereas, Red Spring and Yellow Hard Winter are not. This study indicated that although the vitreosity of South Dakota wheat varied from year to year, most of the wheat was suitable for the production of bread flour on the basis of subclass (table 3).

Grade

Numerical grade represents the minimum in market quality for a grade level because of one or more grading factors. As may be noted in table 3, the percent of samples falling into each grade varied from year to year. Variation in grade is readily explained by the large variation from year to year in the factors that determine grade.

Table 3. South Dakota wheat samples classified according to grade (in percent).

Grade	1963	1964	1965	1966	1967
Hard Red Spring Wheat					
1 heavy	*	9.7	*	0.9	28.6
1	23.8	20.3	25.5	11.5	11.8
2 heavy	*	*	*	0.0	23.1
2	12.2	25.9	27.4	11.7	12.2
3 heavy	*	*	*	0.9	8.1
3	18.9	25.5	20.1	28.3	9.6
4	24.3	9.9	11.7	20.5	6.0
5	16.3	7.3	3.5	16.7	0.3
Sample Grade	4.5	1.4	1.8	3.5	0.3
Hard Red Winter Wheat					
1 heavy	*	*	*	44.6	47.6
1	60.9	68.1	10.6	32.8	16.1
2 heavy	*	*	*	0.5	19.4
2	15.2	18.3	20.7	12.4	6.5
3 heavy	*	*	*	0.6	3.6
3	13.5	8.7	22.3	5.9	3.2
4	7.8	3.8	15.1	2.7	2.8
5	0.9	0.7	14.0	0.5	0.0
Sample Grade	0.7	0.4	17.3	0.0	0.8

*Data not available.