

COMPARISON OF QUALITY OF HARD RED WINTER AND HARD RED SPRING WHEAT QUALITY GROWN IN NORTH DAKOTA

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North Dakota has been the major producer of hard red spring (HRS) wheat. The four-state region consisting of Montana, North and South Dakota and Minnesota grows approximately 95 percent of the total HRS wheat grown in the United States, with North Dakota growing approximately 45 percent.

The spring wheat region of the United States has over the years gained a reputation for high quality bread wheat. Traditionally, 50-60 percent of this wheat goes into the export market, where much of it is used to blend with poorer quality wheats grown in the respective importing countries.

For many years, a small amount of hard red winter (HRW) wheat has been produced in North Dakota. The production area has been primarily in the southwestern portion of the state. Recently production in North Dakota has increased. In addition, the increase has taken place to a large extent in eastern North Dakota. With the increase in production it was decided that the quality of the HRW wheat being grown commercially should be assessed.

Sample and Methods

Since the early 1960s, the Department of Cereal Science and Food Technology (formerly the Department of Cereal Chemistry and Technology) has conducted a survey of the quality of North Dakota's hard red spring wheat crop. In 1980 this survey was expanded to include Montana, South Dakota and Minnesota.

The number of samples collected for any particular county was based on the amount of wheat grown in that county during the past three crop years.

The two sample collectors employed by the department collected samples from a farm bin or local elevator. In most instances the samples were from elevators and reflected the condition of the grain at that particular location.

To assess the quality of hard red winter wheat grown in North Dakota during 1984, a limited survey was con-

ducted. Three districts in the state with the largest production of HRW wheat were surveyed. The number of samples collected for each of the three districts (6, 7 and 9) was 29, 37 and 46, respectively. For milling, flour evaluation and physical dough and bread properties, measured aliquots of each sample were composited for each of the three districts.

The results obtained were compared with the average quality data obtained for hard red spring wheat grown in the same three districts. Quality data on the entire hard red spring wheat crop grown in the four-state region has been published.

Results and Discussion

Grading Information

Tables 1 and 2 provide grading information and wheat data, respectively, for the two classes of wheat grown in the three districts. In addition, average values for the three districts are given.

Test weight, on the average, for the hard red spring wheat was 1.3 pounds per bushel less than for the hard red winter wheat. The HRS wheat also contained a greater percentage of shrunken and broken kernels.

As noted in Table 2, dockage was similar for both classes of wheat. Moisture content of HRS wheat was 1 percent less than HRW wheat. Similar to test weight, 1000 kernel weight was lower in the HRS wheat. On an "as is" and 14.0 percent moisture basis, the HRW wheat grown in these three districts of North Dakota was 1.7 and 1.5 percent lower in protein than the HRS wheat. Wheat ash was higher in the HRS wheat. Both the HRS and HRW wheat gave high falling number and low GAA values, indicating the lack of any sprouting.

Flour Data

Pertinent quality information on the flour obtained from the HRS and HRW wheat grown in the three districts of North Dakota is presented in Table 3.

A higher flour extraction was obtained with the HRW wheat at approximately the same ash content. Flour protein from the HRW wheat was 1.8 percent lower

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Table 1. 1984 North Dakota Wheat Crop: Grading Information (HRS vs HRW)

| Crop Reporting District | Wheat Class | Test Weight (lb/bu) | Test Weight (kg/hl) | Shrunken & Broken (%) | F.M. (%) | Damage (%) | Total Defects (%) | Cont. Classes (%) | Grade |
|-------------------------|-------------|---------------------|---------------------|-----------------------|----------|------------|-------------------|-------------------|-------|
| 6 | HRS | 60.5 | 77.9 | 2.0 | 0.0 | 0.0 | 2.0 | 0.0 | 1 DNS |
| 6 | HRW | 62.5 | 80.4 | 1.2 | 0.2 | 0.0 | 1.4 | 0.0 | 1 HRW |
| 7 | HRS | 60.6 | 78.0 | 2.6 | 0.1 | 0.0 | 2.7 | 0.0 | 1 DNS |
| 7 | HRW | 60.8 | 78.3 | 1.6 | 0.0 | 0.0 | 1.6 | 0.0 | 1 HRW |
| 9 | HRS | 60.1 | 77.4 | 2.8 | 0.0 | 0.0 | 2.8 | 0.0 | 1 DNS |
| 9 | HRS | 61.8 | 79.5 | 1.2 | 0.4 | 0.0 | 1.6 | 0.0 | 1 HRW |
| Average | HRS | 60.4 | 77.7 | 2.5 | 0.0 | 0.0 | 2.5 | 0.0 | 1 DNS |
| Average | HRW | 61.7 | 79.4 | 1.3 | 0.2 | 0.0 | 1.5 | 0.0 | 1 HRW |

Table 2. 1984 North Dakota Wheat Crop: Wheat Data (HRS vs HRW)

| Crop Reporting District | Wheat Class | Dock. (%) | Moist. (%) | 1000 Kernel Weight (g) | Protein ¹ (%) | Protein ² (%) | Protein ³ (%) | Ash (%) | Falling Number (sec) | Grain Amylase Analyzer (units) |
|-------------------------|-------------|-----------|------------|------------------------|--------------------------|--------------------------|--------------------------|---------|----------------------|--------------------------------|
| 6 | HRS | 0.6 | 11.1 | 31.6 | 14.0 | 13.5 | 15.7 | 1.66 | 494 | 22 |
| 6 | HRW | 0.5 | 12.3 | 33.3 | 12.9 | 12.5 | 14.5 | 1.48 | 507 | 4 |
| 7 | HRS | 0.6 | 10.3 | 27.1 | 14.4 | 13.8 | 16.0 | 1.60 | 489 | 6 |
| 7 | HRW | 1.2 | 10.8 | 30.3 | 12.4 | 12.0 | 14.0 | 1.53 | 492 | 4 |
| 9 | HRS | 1.2 | 10.9 | 28.9 | 14.8 | 14.2 | 16.5 | 1.66 | 458 | 2 |
| 9 | HRW | 1.0 | 12.2 | 31.2 | 12.8 | 12.4 | 14.4 | 1.63 | 527 | 4 |
| Average | HRS | 0.8 | 10.8 | 29.2 | 14.4 | 13.8 | 16.1 | 1.64 | 480 | 10 |
| Average | HRW | 0.9 | 11.8 | 31.6 | 12.7 | 12.3 | 14.3 | 1.55 | 509 | 4 |

¹ As is moisture basis

² 14.0% moisture basis

³ Dry matter basis

than in flour derived from the HRS wheat. Wet gluten was approximately 4.0 percent higher in the HRS compared to the HRW wheat. Falling number and amylograph values in the flour were high for both classes of wheat.

Physical Dough Properties

Physical dough properties as measured with the farinograph (Table 4) indicated that HRS wheat was approximately 2 percent higher in absorption than the HRW wheat. Also, the dough mixing properties of HRS wheat were considerably stronger than for the HRW wheat. This was noted with the extensigraph test as well.

Baking Properties

Data on the baking properties of the HRW and HRS wheat grown in the three districts evaluated are presented in Table 5. Higher absorption and loaf volume and higher crumb grain and texture and color scores were found for the HRS compared to the HRW wheat.

Summary

In conclusion, the limited quality survey conducted on the 1984 hard red winter wheat crop of North Dakota indicated higher values for test weight, 1000 kernel weight, moisture and flour extraction than for hard red spring wheat grown in the same districts. The winter wheat, however, gave lower values for wheat and flour protein contents and wet gluten and was weaker in mixing properties as well as having lower baking absorption and loaf volumes.

References

1. D'APPOLONIA, B.L., BANASIK, O.J., OLSON, T.C. and MATTHIENSEN, G. 1984. The quality of the regional (Montana, North and South Dakota, Minnesota) 1984 hard red spring wheat (DNS) crop. North Dakota State Wheat Commission Bulletin, October.