

Summary

In spite of the worst drought in a decade, the North Dakota farmers produced the second largest crop of hard red spring wheat on record. In addition, the crop has a high test weight, is relatively free from damaged kernels and possesses excellent milling, baking and physical dough qualities.

It is estimated that 70 per cent of the crop graded Number 1 and that 95 per cent graded Number 2 or better. The samples obtained from the elevators (merchandized wheat) showed an average dockage of 0.6 per cent with a range of 0.1 to 4.3 per cent. For all samples tested the average moisture and protein contents are 10.3 and 14.2 per cent, respectively.

The wheat mills in a normal manner producing a high flour yield with good color and a low ash content. The baking absorption appears to be a little lower than last year's crop, but otherwise the baking characteristics are the same. The mixing time and tolerance as measured by the Farinograph were a little lower than last year. However, the curve in general is normal and strong. The dough elasticity as measured by the Extensograph is slightly less than was reported for the 1966 crop.

When the 1967 crop is compared with the 5-year average, it is better in test weight, hectoliter weight, vitreous kernel content, flour ash, general baking characteristics and physical dough properties. It is a little lower than the average in flour yield and baking absorption. These characteristics can be explained by the fact that the predominating variety in North Dakota is changing periodically.

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HARD RED SPRING WHEAT

ABSTRACT

The quality data presented in this report indicate that the 1967 hard red spring (northern spring) wheat crop of 125 million bushels (3.4 million metric tons) from North Dakota, USA is excellent. The test weight (hectoliter weight), flour ash, falling number, and diastatic activity are all better than for the 1966 crop. While the wheat protein, physical dough and baking properties are a little lower than last year, they are still considered to be excellent. Technical details shown in this report indicate that the baking quality for this crop is better than the average for the past five years.

METHODS - HARD RED SPRING WHEAT

WHEAT

- Test Weight per Bushel: Cereal Laboratory Methods (CLM)*; method 84-10.
- Hectoliter Weight: Calculated from the test weight per bushel.
- Thousand Kernel Weight: Ten grams of cleaned wheat (free from foreign material and broken kernels) are counted, using an electronic seed counter. The calculated weight for 1,000 kernels is reported.
- Kernel Size (0.064 x $\frac{3}{8}$ sieve): A 0.064 x $\frac{3}{8}$ sieve is a metal sieve 0.0319 inch thick perforated with oblong holes 0.064 inch by 0.375 ($\frac{3}{8}$) inch which are $\frac{1}{8}$ (0.1250) inch from center to center and with 0.0525 inch end bridges. The perforations are staggered in relation to the adjacent rows. One hundred grams of wheat are placed on the sieve, which is rotated 30 times. The material passing through the sieve is reported.
- Kernel Size (2-10 x 20 sieve): This sieve, which is used extensively in Europe, is a metal sieve with slotted holes 2.1 mm wide by 20 mm long with 84 perforations per 10 sq. cm. One hundred grams of wheat are placed on the sieve which is rotated 30 times. The material passing through the sieve is reported.
- Grade: The grade is determined by a United States licensed inspector using the Official Grain Standards of the United States (SRA-AMS-177) as revised May, 1964.
- Vitreous Kernels (Vit. Kernels): The vitreous kernels from 50 grams of wheat are hand picked, weighed and reported.
- Protein: CLM; method 46-10, expressed on 14.0 per cent moisture basis.

FLOUR

- Yield: Thoroughly cleaned wheat is tempered to 16.0 per cent moisture for 16 hours; scoured, and an additional temper of 0.5 per cent made 5 minutes prior to milling. The milling laboratory is controlled at 68 per cent relative humidity and 72° to 74° F. Milling is performed in a Buhler laboratory mill (Type MLU-202). All six flour streams are blended and reported as "flour yield". The blended flour is rebolted through 60 SS and 80 SS sieves to remove any foreign material. This product is used for the other flour quality determinations.
- Ash: CLM method 08-01 expressed on 14.0 per cent moisture basis.
- Protein: CLM method 46-10 expressed on 14.0 per cent moisture basis.
- Wet Gluten: CLM method 38-11 expressed on 14.0 per cent moisture basis.
- Diastatic Activity: CLM method 22-15. Results reported as milligrams maltose per 10 g. of flour.
- Falling Number: The flour is obtained by passing the wheat through a Brabender Quadramat Jr. mill and sifting the ground whole wheat through a No. 70 US standard sieve (200u). The procedure, described in Cereal Chem. 38, 202-203 (1961) requires 7.0 g. flour (15.0% M.B.) and 25 ml. distilled water. Results are expressed in units (seconds).
- Absorption (Baking): Calculated from the Brabender Farinograph absorption with adjustments made if necessary and expressed on 14.0 per cent moisture basis.

BAKING

- Procedure: A malt-phosphate-bromate formula with 5 per cent sugar, variable mixing time and two fermentation periods using a straight dough are employed. One hundred grams of flour (constant moisture basis) with appropriate amounts of baking ingredients are mixed to maximum dough development. The dough is fermented in porcelain bowls in a cabinet controlled at 30° C and 78 per cent R.H. with two punches during a 3-hour fermentation, a proof period of 55 minutes then baked at 230° C. for 25 minutes.

- Dough Characteristics (Dough Char.): Handling qualities of the fermented dough; assessed at panning time. (4 equals very good; 3 equals good; 2 equals fair; 1 equals poor).
- Loaf Volume (Loaf Vol.): Rape seed displacement measurement made 30 minutes after bread removed from oven.
- Grain and Texture (Gr. & Tex.): Visual comparison with a standard, using a constant illumination source. Perfect score is 10.0.
- Crumb color: Visual comparison with a standard, using a constant illumination source. Perfect score is 10.0.
- Crust Color: Visual comparison with a standard, using a constant illumination source. (4 equals very good, 3 equals good; 2 equals fair; 1 equals poor).
- Symmetry: Visual comparison with a standard, using a constant illumination source. Perfect score is 5.0.

PHYSICAL DOUGH PROPERTIES

FARINOGRAM:

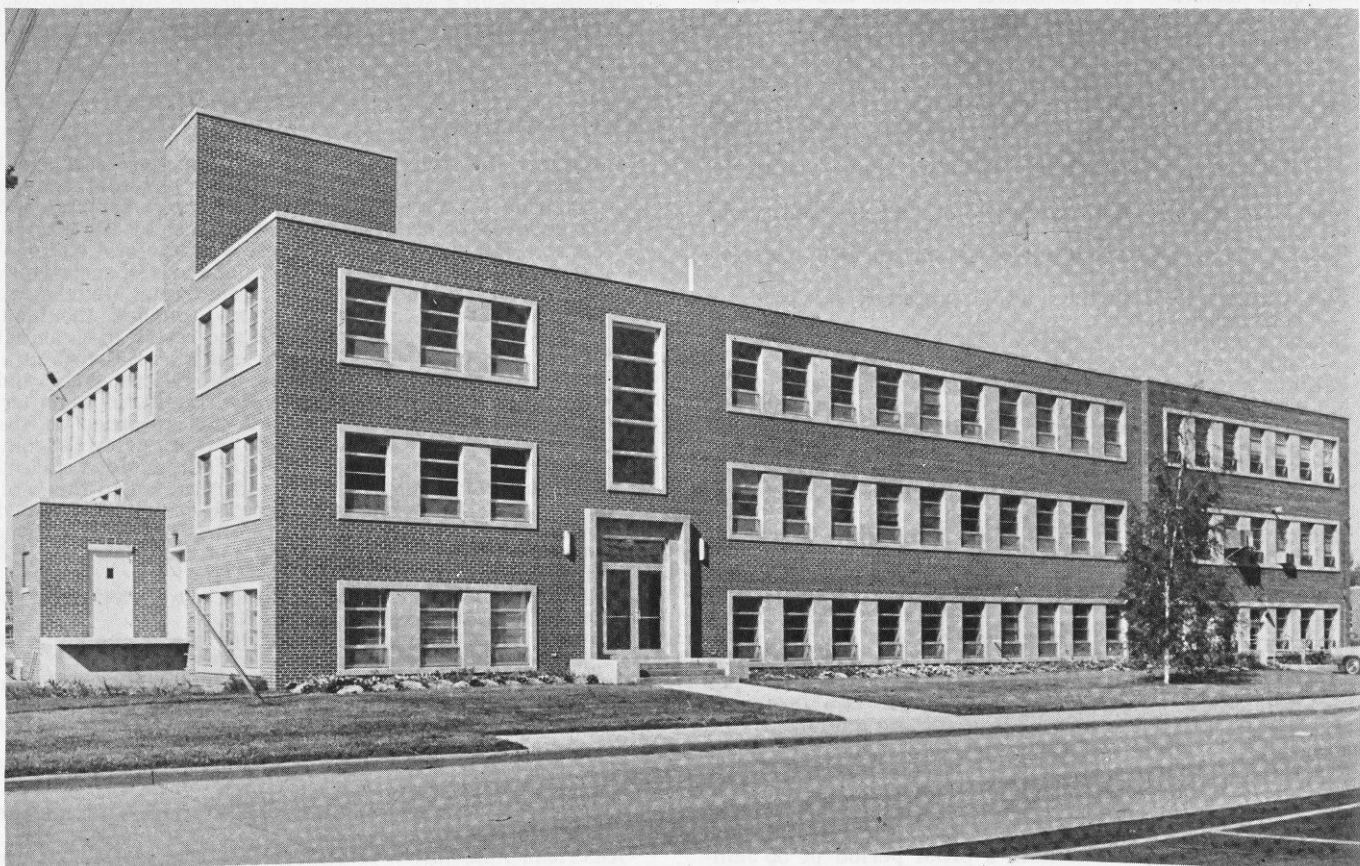
- Procedure: Fifty grams of flour on a constant moisture basis are mixed in a small stainless steel Farinograph bowl with sufficient distilled water to give a maximum dough consistency centered on the 540 Brabender unit line.
- Absorption: Amount of water (cc x 2) required to center curve peak on the 540 Brabender unit line.
- Mixing Time (Mix Time): Time in minutes required for the center portion of the farinogram to reach the 540 Brabender unit line.
- Mixing Tolerance (Mix. Tol.): Time in minutes that the curve remains horizontal on the 540 Brabender unit line.
- Mixing Tolerance Index (M.T.I.): CLM method 54-21.
- Classification: An overall empirical classification incorporating mixing time, mixing tolerance, and general curve characteristics is assigned.

EXTENSOGRAM:

- Procedure: One hundred grams of flour, on a constant moisture basis, are mixed with 1.0 per cent sodium chloride U.S.P.; 0.003 per cent potassium bromate and a quantity of water as pre-determined by the Farinograph. Mixing is performed using a Standard National Dough Mixer with variable mixing times in accordance with data obtained from the farinogram. Doughs are scaled, after mixing to 150 grams, rounded, moulded, placed in extensogram holders, and rested in a cabinet controlled at 30° C. + 78 per cent R.H. After 45 minutes, the dough is stretched in the Extensograph and a curve drawn. The dough is then gathered together, placed in a fermentation bowl and returned to the cabinet for an additional rest period. After 90 minutes, the dough is removed, rounded, moulded, placed in the Extensograph holder, and returned to the cabinet. After 45 minutes, a second curve is obtained which is super-imposed over the first curve. The lower tracing is the 45 minute curve and the upper, the 180 minute one.
- Extensibility, 45 min: The length of the lower curve is measured and reported.
- Extensibility, 180 min: The length of the upper curve is measured and reported.
- Resistance, 45 min: The maximum height of the lower curve is measured and reported.
- Resistance, 180 min: The maximum height of the upper curve is measured and reported.
- Area: The area under the 180 min. curve is measured and reported.
- Classification: An overall empirical classification of the 180 min. curve is assigned.
- *American Association of Cereal Chemists, Cereal Laboratory Methods (7th Edition), St. Paul, Minn. (1962).



Trade Missions and visitors from many countries come to see wheat research conducted at North Dakota State University.



A view of the recently completed addition to the Cereal Chemistry and Technology Building at North Dakota State University, Fargo.