

New Quality Data On Dakota Durums

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This report discusses the quality of four comparatively new durum wheat varieties grown for three years in experiment station plots at various locations in North Dakota.

Three other varieties, Mindum, Sentry and Vernum, which had been grown extensively before the advent of 15B stem rust, are used as standards with which to compare the new wheats.

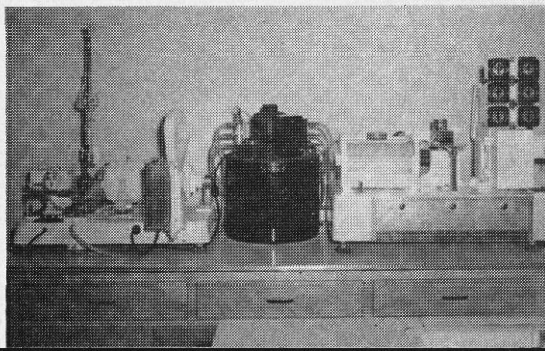
The methods and equipment used were described by Sibbitt, Scott and Harris in the Bimonthly Bulletin for January-February, 1956, and will, therefore, not be discussed in this report. Essentially they are based upon commercial practice and correspond to those employed in other laboratories for evaluating durum quality.

Figure 1 illustrates the Farinograph and Extensograph employed for obtaining the farinograms and extensograms shown in Fig. 4. This equipment is located in the Grain Products Laboratory on the campus of North Dakota Agricultural College. It is useful in evaluating the dough properties of new varieties of wheat which may later be grown on the farms of the state.

Results and Discussion

Table I shows the yield per acre and some of the quality data from the wheats. As previously reported in 1956, Langdon had the highest yield per acre, with Ramsey next highest. Mindum was the lowest with the remaining four varieties giving intermediate yields. For test weight, Towner was again the highest, followed by Ramsey. All the remaining varieties except Mindum were above 60 pounds. Mindum was also definitely lower than the others in both wheat and semolina protein content while Yuma was the highest, as found before. For semolina yield, Mindum was the lowest with Ramsey and Langdon the highest. The

Figure 1.—Physical dough testing equipment. Farinograph at left, Extensograph at right of figure.



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**TABLE I.—Wheat Quality Values for Seven Durum Varieties
(nine replicates).**

| Variety | Yield b.p.a. | Test weight lbs./bu. | Approx. vitreous kernels percent | Protein ¹ | | Semolina yield ¹ | |
|---------------|-----------------|----------------------------|---|----------------------|---------------------|-----------------------------|---------------------|
| | | | | Wheat percent | Semolina percent | Unpurified percent | Purified percent |
| Langdon | 37.9 | 61.7 | 88 | 13.7 | 12.6 | 72.5 | 58.2 |
| Sentry | 32.6 | 61.3 | 86 | 14.2 | 13.2 | 70.9 | 56.3 |
| Ramsey | 36.2 | 62.2 | 90 | 13.5 | 12.6 | 72.6 | 58.0 |
| Mindum | 27.1 | 59.8 | 87 | 12.2 | 11.4 | 68.2 | 54.5 |
| Vernum | 30.5 | 60.6 | 87 | 13.6 | 12.6 | 69.3 | 55.4 |
| Yuma | 32.7 | 60.1 | 91 | 14.6 | 13.4 | 71.4 | 57.0 |
| Towner | 31.9 | 63.0 | 92 | 13.7 | 12.6 | 70.8 | 55.1 |

Note ¹Expressed on 13.5 percent moisture basis.

remaining varieties were more or less intermediate in semolina yield.

Table II shows additional quality data obtained from the semolina. For ash content all the varieties were quite similar, except Ramsey and Mindum which were slightly higher than the others. Little differences were obtained among the varieties in speck count, with the exception of Yuma, which had distinctly less speckiness than the other semolinas. Low speck count is desirable.

Water absorption was very similar for all the varieties. Yuma and Vernum, however, were slightly higher than the others. For the 1956 crop samples, a tentative absorption was pre-determined by the Farinograph before mixing the dough for processing instead of using as an indication of absorption the plasticity of the

dough as obtained at the mixer. This new method offers some advantages over the alternative procedure and has proved helpful in furnishing an objective value. Further work with the Farinograph absorption determination is planned. The macaroni visual color score is discussed in the following paragraph.

Figure 2 represents the average macaroni color score of the seven durum varieties grown for three years in North Dakota. Langdon and Sentry yielded the best results, while Ramsey, Mindum, Vernum and Yuma were definitely lower and quite similar to each other. Towner was the lowest in color as reported before. Yuma commonly shows a reddish tinge in the macaroni and has been occasionally faulted by the industry for this reason. However, a reddish tinge is less objectionable

**TABLE II.—Semolina and Macaroni Quality for Seven Durum Varieties
(nine replicates).**

| Variety | Ash content ¹ | Semolina specks per 10 sq. in. | Absorp- tion ¹ | Visual color score of macaroni | Mixing pattern |
|---------------|-----------------------------|--------------------------------------|------------------------------|--------------------------------------|-------------------|
| | percent | | percent | | |
| Langdon | 0.60 | 34 | 28.0 | 8.9 | Weak, |
| Sentry | 0.61 | 46 | 28.1 | 8.9 | Very Weak |
| Ramsey | 0.64 | 32 | 28.0 | 8.0 | Medium Weak |
| Mindum | 0.64 | 26 | 28.4 | 7.9 | Medium Strong |
| Vernum | 0.62 | 39 | 28.6 | 7.9 | Medium Strong |
| Yuma | 0.61 | 16 | 28.8 | 7.8 | Strong |
| Towner | 0.59 | 30 | 28.3 | 7.2 | Weak |

Note ¹Expressed on 13.5 percent moisture basis.

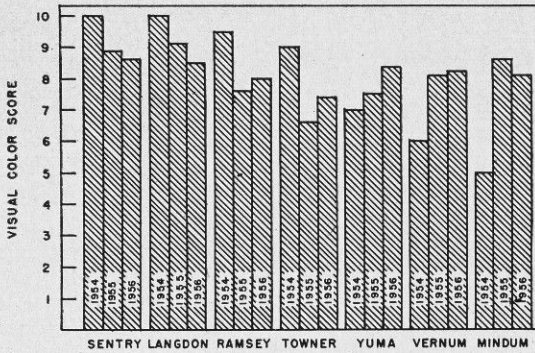


Figure 2.—Visual macaroni color score of the seven varieties.

than a grayish or pale hue. The ranking of the varieties is the same as reported in the January-February, 1956, Bimonthly Bulletin.

The effect of year of growth on the macaroni color of the seven varieties is shown in Fig. 3. These data provide information on the differences in macaroni color which may be expected in different years in this state. For Sentry and Langdon, color decreased consistently from 1954 to 1956. Ramsey and Towner had the best color in 1954, while Yuma showed an improvement from 1954 through 1956. Vernum and Mindum were significantly low in 1954, probably because of stem rust 15B infection.

The physical dough properties of durum varieties are becoming more important with the increase in automatic macaroni processing in industry. Weak, sticky doughs are not desirable, and future breeding programs are planned to develop stronger gluten characteristics. Gluten properties can be determined in several ways, such as separating the gluten from the starch in semolina by "washing" and then examining its elasticity and ability to stretch. Or chemical treatment may be used to detect the swelling or absorption of water by different wheat glutes. However, use of standardized and largely automatic apparatus for testing gluten quality through measure-

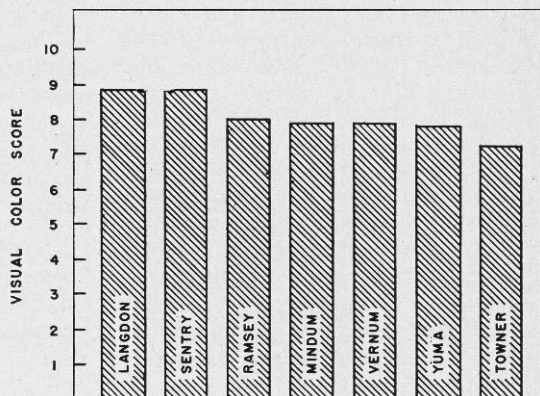


Figure 3.—Yearly variation in macaroni visual color score of the seven varieties.

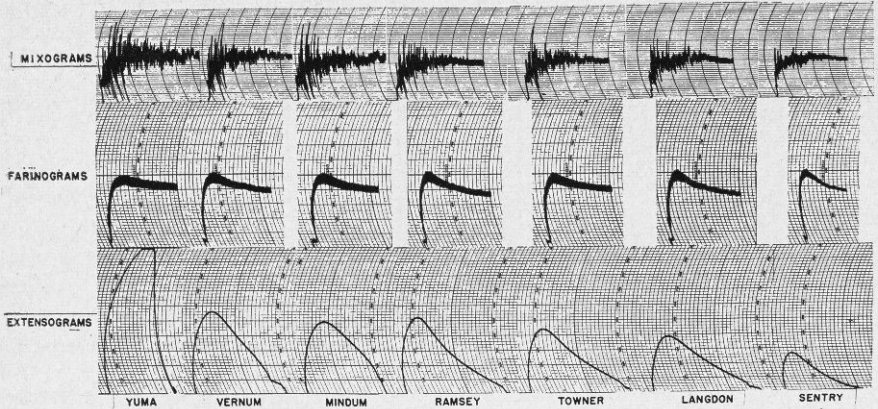


Figure 4.—Mixogram, farinogram and extensogram patterns obtained from the varieties arranged in general order of decreasing strength from left to right.

ment of the physical properties of dough offers some distinct advantages.

Figure 4 shows the dough properties of the seven durum varieties as represented by the changes occurring during mixing the dough, using semolina and distilled water, and the extensibility of the doughs after optimum mixing. For the extensograms 1 percent of sodium chloride was added. The mixogram and farinogram curves are arranged approximately in decreasing order of strength from left to right. Thus Yuma would be ranked as the strongest in mixing and gluten strength, while Sentry would be weakest.

Several chemists connected with the durum processing industry have observed that Yuma has a short and tough gluten which is not quite as satisfactory as the other varieties. Sentry gluten tends to be slightly sticky, but this variety has been well accepted by industry. Its mixing curves show evidence of weakness to the experienced observer, especially

the farinogram. The extensograms confirm the conclusions reached from the mixing curves, and emphasize the different gluten properties of Yuma shown by the exaggerated height of the curve, while Sentry had the lowest curve height.

Curve height indicates the resistance of the dough to stretching, and shows that Yuma had the strongest dough, and Sentry the softest or weakest. The other wheats were intermediate between the two extremes.

From the overall quality standpoint Langdon appears to be the best durum variety in these comparisons. While Sentry is equal in macaroni color it does not have as satisfactory semolina dough properties as Langdon. Yuma is probably the least satisfactory in quality of the seven varieties discussed in this report.

It is planned later to publish information on the relative cooking quality of these durum wheats. This work is not completed at the present time.