

NEW DURUM WHEATS ARE HIGH IN MACARONI QUALITY¹

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This report presents results secured from samples of six varieties of durum wheat grown from 1941 to 1947 inclusive at the Langdon Substation under the supervision of Superintendent Victor Sturlaugson. These samples were experimentally milled at the Fargo Station, and the resultant purified semolina processed into macaroni by standardized experimental methods. About 10 lbs. of wheat are required for these tests. The Department of Cereal Technology of the Experiment Station possesses an experimental durum wheat mill complete with a purifier which is employed in removing bran specks from semolina and thus improving the color of the product, a miniature macaroni processing unit, and an experimental drying cabinet. The equipment is illustrated and described in detail in a special bulletin entitled "Durum Wheat Improvement Investigations in North Dakota" published by the Station July 1, 1946, and therefore will not be explained in this paper.

The six varieties dealt with in this report are Mindum, Kubanka, Carleton, Stewart, Vernum, and Monad. Mindum was a head selection made at the Minnesota Experiment Station and was distributed in 1917. Kubanka was introduced into the United States from Russia in 1899; Monad was introduced from Russia about 1903. Carleton and Stewart were released by the North Dakota Experiment Station in 1943, and also Vernum in 1947. The latter three varieties were developed at this Station by Dr. Glenn Smith of the Bureau of Plant Industry, U.S.D.A., and the Experiment Station. Carleton has very stiff straw, while Stewart excels in yield and resistance to shattering. They both have been favorably received by farmers. Stewart was the favorite at first, but latest indications are that Carleton is increasing in popularity. Vernum's chief merit lies in a shorter growing period (at least 3 days less) than Carleton.

Table I provides information on the average yield per acre from the plots at Langdon, test weight, wheat and semolina protein content, semolina yield and macaroni color of these wheats. For yield per acre Stewart is high, while Monad is low. Yield differences among the other varieties are not very important. Test weights are excellent, with Kubanka and Monad tending to be the lowest. The latter is also lowest in vitreous kernel content. If stem rust had been prevalent during any of the years covered by this investigation the differences in some of the characteristics measured might have been greater, as, for instance, yield and test weight. The development and release of new wheats was based first on their increased rust resistance.

In wheat and semolina protein the tendency is reversed, with Kubanka having the greatest content. Protein content, however,

¹The quality tests were carried out under an Experiment Station project, Bankhead-Jones 30 entitled "Durum Wheat Quality Studies, with Emphasis Upon Varietal Differences, Gluten Properties, and Macaroni-Processing Effects on the Starch and Gluten."

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TABLE I

**North Dakota Agricultural Experiment Station
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Means of Six Standard Varieties
Grown Comparably at Langdon Branch Station 1941-1947 incl.
(Arranged in order of decreasing macaroni color score)

Variety	Yield b.p.a.	Test weight lbs./bu.	Approx. vitreous kernels %	Protein ¹		Semolina yield ²		Ash ¹ %	Specks per 10 sq. in.	Absorp- tion ¹ %	Macaroni visual color score
				Wheat %	Semolina %	Unpurified %	Purified %				
Carleton	38.6	63.4	90.0	13.8	12.6	62.6	43.8	0.50	11.0	26.7	8.7
Stewart	41.8	63.4	90.7	13.7	12.3	63.0	44.8	0.46	12.6	26.7	8.4
Vernum	38.0	62.5	89.3	14.2	12.9	63.6	45.2	0.51	12.3	26.4	8.4
Mindum	40.0	63.0	90.0	13.9	12.7	63.6	45.4	0.50	12.7	26.7	7.8
Kubanka (K314)*	36.2	61.1	88.6	15.0	13.8	62.1	43.7	0.51	13.1	26.6	6.6
Monad	33.8	60.4	83.6	14.8	13.1	61.4	43.6	0.54	20.0	26.9	3.2
Mean	37.8	62.3	88.7	14.2	12.9	62.7	44.4	0.50	13.6	26.7	7.2
Means of the three new varie- ties (Carleton, Stewart, Vernum)	39.5	63.1	90.0	13.9	12.6	63.0	44.6	0.49	12.0	26.6	8.5

Note: ¹Expressed on 13.5% moisture basis.

²Purified semolina yield is always markedly lower than unpurified because of the removal of bran and other extraneous material during purification.

*K314—Selection of Kubanka which is very similar in plant type to the Kubanka that was originally introduced.

is not the problem in durum wheats that it is in bread type wheats; the semolina protein content is very satisfactory for all the samples. Semolina yields are much the same, as are ash contents, except Stewart, which has the lowest semolina ash. Ash consists of the inorganic constituents of the semolina which were transported from the soil to the wheat kernel by the plant. It is probable that semolina ash content is not as important commercially as is flour ash when dealing with bread wheat flours. Semolina yields are, however, of real interest to the miller because high yields are more profitable. For speck count, Monad semolina is decidedly high; this is a decided defect in a durum variety which is to be used for macaroni making purposes. The water absorption required for dough used in macaroni processing is the same for all the semolina samples.

Macaroni color score is the most important criterion of durum wheat quality because the consumer desires a rich amber color, and dislikes to purchase macaroni which fails to meet the color requirements he has in mind. Table I shows the numerical ratings of the macaroni in the final right-hand column and Figure 1 shows the same data in the form of histograms. The three new varieties are distinctly superior to the other three.

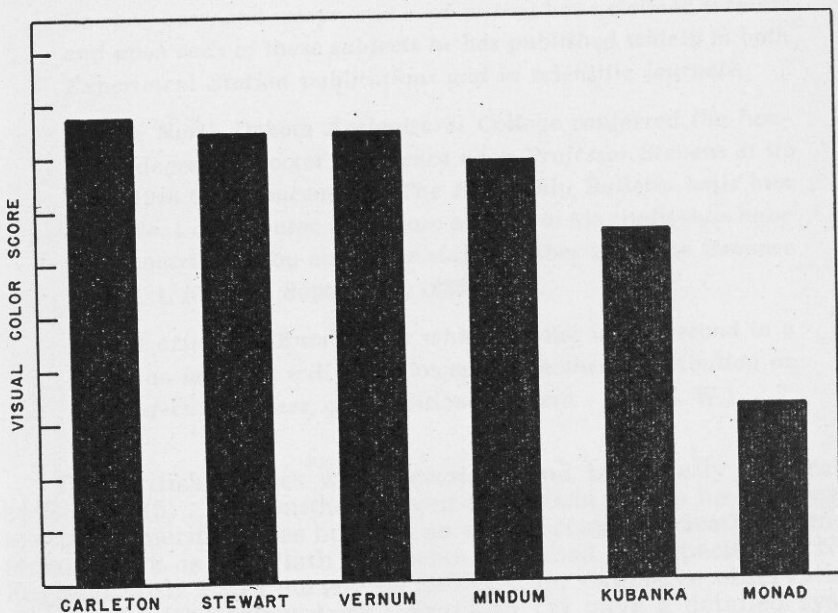


Figure 1. Comparative macaroni color scores of six varieties of durum wheat.

The three new durums all were derived from crosses involving Mindum durum with Vernal emmer ("speltz"): The poor quality of the red-kernelled emmer was overcome by back-crossing selected progenies to Mindum until good macaroni quality was recovered. It is somewhat surprising that any progeny of this cross is superior in quality to the good-quality parent, Mindum.

The rank of these varieties for quality has been very consistent throughout the seven year period, so it seems likely that the superiority of the new varieties is significant. Mindum has always ranked very high for quality in the estimation of the trade, so it is especially gratifying to find the new varieties even better in quality as well as in rust resistance and other agronomic traits.

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