

Experimental Milling and Baking

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The Standard Milling Sample

The practice of this department is to mill a standard flour each year before samples from the variety plots in the different stations have been tested. This flour is milled in exactly the same manner as the regular plot samples, the same weight of cleaned wheat (about four pounds) being employed in each individual milling. Approximately 20 replicate millings are made, and the resultant flours are thoroughly mixed and aged before baking. Fig. 1 shows the experimental milling unit.

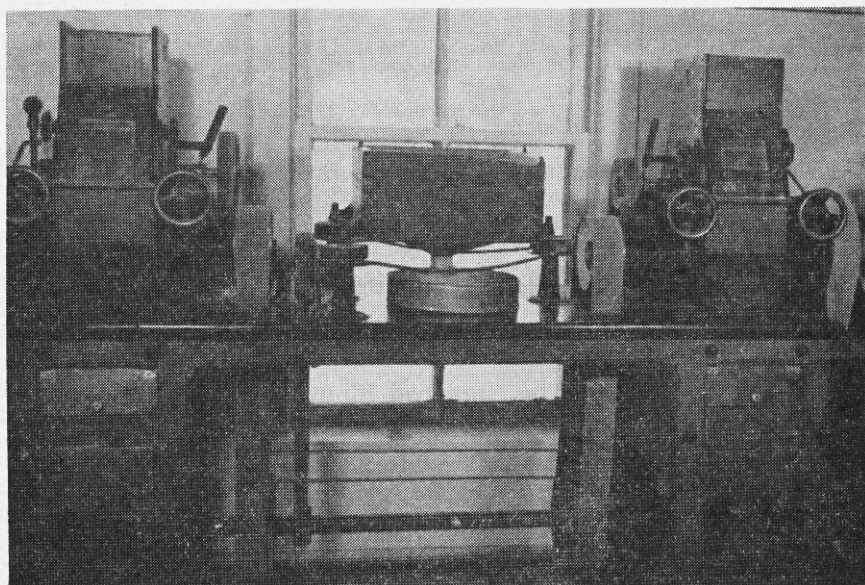


Fig. 1. Experimental flour mill in Department of Cereal Technology, North Dakota Agricultural Experiment Station.

For the original sample, five to 20 pound lots of wheat are secured from commercial elevators through county agents. These consist of samples of the important varieties grown in the state, and they are blended thoroughly in approximate proportion to their acreage. The test weight and protein content of the blend are also determined. Thus, the milling and baking performance of experimentally grown wheats can be compared with a sample representative of the wheats now being grown on North Dakota farms.

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Table 1.—PROPORTIONS OF COMMONLY GROWN HARD RED SPRING WHEAT VARIETIES IN BLEND FOR MILLING STANDARD EXPERIMENTAL FLOUR, WITH ACTUAL ACREAGES FOR 1949

Variety	1945	1946	1947	1948	1949	Proposed 1950	Actual 1949 acreage ^a
	%	%	%	%	%	%	%
Mida	17.0	21.0	20.0	25.0	25.0	45.0	44.0
Thatcher	25.0	26.0	25.0	25.0	25.0	20.0	19.3
Rival	17.0	12.0 ¹	20.0	20.0	20.0	15.0	13.7
Cadet	.....	.....	.....	10.0	10.0	10.0	7.0
Regent	8.0	10.0	10.0	.....	.....	5.0	3.2
Pilot	17.0	21.0	15.0	15.0	15.0	5.0	2.5
Vesta	8.0	.....²	10.0	5.0	5.0	.....	0.8
Renown	8.0	10.0	.....	.....	.....	.....	.....
Other Varieties							9.5

¹Samples of Rival did not arrive in time to raise this average to 20%. The proportions of Renown and Regent were increased to replace the missing percentage of Rival.

²Samples of Vesta could not be obtained.

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Table I shows the varieties and the proportions used for milling flour for the standard baking sample for baking tests in different years. The remarkable increase in the proportion of Mida included in the state acreage is reflected in the blends, while Pilot and Thatcher are decreasing. The acreage of Vesta is now very small, and this variety will be omitted from the 1950 milling and baking standard.

The Standard Flour

The protein and ash content of the standard flour is determined, as well as the absorption. The latter is the quantity of water required to produce a dough of optimum consistency.

In baking experimental loaves of bread it is desirable to bake a standard loaf from an uniform flour each day to determine replicability of loaf volume and for comparison of the exterior and interior loaf characteristics, as symmetry of shape of the loaf, crust and crumb color, grain and texture, etc. The standard loaf also serves as a check on the performance of the baking equipment, since any significant departure from uniformity in its functioning would be reflected in the characteristics of the standard loaf.

Substitutes for the standard loaf have been suggested from time to time, but none has been generally accepted by baking technologists. Substitutes have usually consisted of painted panels with color designed to match that of a desired loaf, colored photographs of loaves which show crumb grain and texture as well as color, and similar objects. It is very difficult, however, to precisely reproduce the attributes of the baked loaf. Painted colors tend to fade; the suitability of any artificial standard changes with type of

wheat, with flour extraction, and with baking formula and procedure. A disadvantage of the standard flour is that it tends to produce a better loaf as it "ages"; the color improves, and the loaf volume generally increases. Finally, a situation of stability is attained, and further improvement then ceases. Unless optimum storage conditions are employed, deterioration may eventually set in.

Table II—QUALITY DATA FROM THE STANDARD MILLING SAMPLE AND RESULTANT FLOURS FOR A FIVE-YEAR PERIOD

Year	Test weight	Wheat		Flour		Total flour yield ¹	Ash ¹	Loaf volume	Crumb color ²
		Protein ¹	Moisture	Moisture	Protein ¹				
	lbs./bu.	%	%	%	%	%	%	cc.	
1945	61.8	11.4	13.2	14.2	12.0	72.8	0.40	672	7.2
1946	59.4	11.0	12.9			70.7	0.40	630	7.1
1947	58.9	9.9	14.2	13.6	12.9	71.6	0.41	664	7.3
1948	60.1	10.2	13.7	13.3	13.2	72.5	0.41	692	7.4
1949	60.9	10.2	13.9	13.2	12.9	72.1	0.46	727	7.8

¹Expressed on 13.5% moisture basis.

²Perfect score—10.0

Table II shows the comparative mean values of the milling, baking, and miscellaneous data for five years. The test weight has varied to some extent from year to year, the lowest value being obtained in 1947, when wheat protein was highest. For the last three years there has been no important difference in the protein content of the standard sample. Flour yields were good. The loaf volume and crumb color have tended to increase for the last three years. The ash content was highest in 1949.

This flour is not bleached and is more creamy in color than commercial flours. None of the flour produced in this department is bleached previous to baking, but an oxidizing and bleaching agent is included in the baking formula. In addition to constituting a baking standard, the flour is used for the preparation of large uniform quantities of dried starch and gluten which are employed for studies concerned with the properties of these wheat components and their relation to wheat quality. Bakings with flours diluted to a constant uniform protein content with wheat starch yield information of the baking quality of the wheat gluten or protein, since the influence of protein content on quality has been removed.

Conclusions

The milling and baking standard each year provides a comparison between the quality of wheats grown on the farms in the state and the varieties grown in the Experiment Station variety testing plots. These comparisons are particularly important when new varieties are being tested with the purpose of releasing them if their agronomic and milling and baking quality warrant.