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QUALITY EVALUATIONS OF HARD RED SPRING AND WINTER WHEATS 1961-1965

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SUMMARY

Gluten quality, the factor which directly determines the quality of wheat for bread baking, varies significantly from year to year even though protein percentage is about the same.

Climatic conditions during the growing season influence gluten strength. High precipitation with normal temperatures produces high yield, low protein and weak gluten. Low precipitation with normal temperatures usually means a low yield, high protein and strong gluten. Extremely high temperatures during the wheat fruiting stage may weaken the gluten without affecting total protein content.

The crop years 1961, 1962 and 1963 produced hard red winter wheats with high average protein content and strong gluten. Wheats from 1964 and 1965 had lower protein content and weak gluten strength. The gluten strengths of 1964 and 1965 wheats produced similar farinograph curves, but experimental bread baking proved the 1964 wheat to be definitely superior.

Hard red spring wheats from 1961 and 1963 crops had quality superior to 1962, 1964 and 1965 crops. Spring wheats produced better bread-baking flours than winter wheats which had similar quality data.

QUALITY EVALUATIONS OF HARD RED SPRING AND WINTER WHEATS 1961-1965

INTRODUCTION

The Idaho Wheat Quality Laboratory has evaluated the bread-baking quality of hard red winter and spring wheats for 5 crop years, 1961 through 1965. Samples came from wheat breeders' selections and from primary, advance, uniform and regional nurseries. These include irrigated plots at Aberdeen and Twin Falls, and dryland plots at Fairfield, Heglar, Preston and Tetonia.

When quantity of the sample permits, quality evaluations include all of the following tests:

Wheat Protein Content—determined by a modified Udy Analyzer dye-binding process (1).

Sedimentation Value—determined by either the standard method (2) or the semimicro method (3). This test requires only a small amount of material to estimate quickly and simply the strength of a wheat.

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Table 1. Aberdeen monthly precipitation and monthly mean temperature, 1961 through 1965, plus monthly averages, 1915 through 1965.

Month	1961		1962		1963		1964		1965		Average 1915 - 1965	
	Prec.	Temp.	Prec.	Temp.	Prec.	Temp.	Prec.	Temp.	Prec.	Temp.	Prec.	Temp.
Jan.	0.12	23.3	0.54	13.9	1.07	14.6	0.38	14.6	0.57	27.3	0.69	20.4
Feb.	0.73	34.1	0.91	27.4	1.08	36.2	0.14	10.7	0.44	27.9	0.60	26.5
March	0.64	37.9	0.57	31.2	0.38	35.5	0.35	21.6	0.05	30.7	0.63	35.2
April	0.81	44.4	0.36	47.2	2.26	42.4	1.11	40.1	1.82	45.5	0.87	43.7
May	2.14	54.4	1.72	50.3	2.50	54.2	1.83	50.9	1.57	48.9	1.13	53.5
June	0.12	66.8	0.77	58.0	1.93	56.7	1.66	57.3	1.28	58.6	0.83	60.5
July	0.31	70.3	1.32	66.0	0.00	65.9	0.09	69.4	1.14	66.4	0.45	69.4
Aug.	0.47	70.2	0.77	63.9	0.47	67.6	0.10	63.7	0.76	63.9	0.48	67.3
Sept.	2.59	53.1	0.63	56.9	1.56	69.5	0.02	53.6	0.58	50.4	0.60	57.5
Oct.	2.10	44.8	0.51	47.5	0.29	50.4	0.72	46.4	0.01	47.5	0.84	47.3
Nov.	0.30	33.4	0.14	36.5	1.48	33.7	0.98	33.2	1.29	38.6	0.70	34.0
Dec.	0.42	25.6	0.24	27.1	0.99	16.8	3.56	26.6	1.07	25.2	0.70	25.9

Farinograph—charted from individual flour samples to predict the quality or strength of the gluten and to estimate the water absorption of the flour. A long curve shows strong gluten and a potential for good bread-baking quality. A short curve shows weak gluten and the probability of poor bread-baking quality.

Bread Baking—the ultimate test of the ability of a wheat to yield flour that will produce bread of satisfactory loaf volume and internal characteristics. Experimental bread baking was started in this laboratory in 1962 after the building was constructed and necessary equipment installed. Data in Tables 3 and 4 are incomplete because of inadequate baking facilities, limited size of submitted samples or lack of samples from some areas.

CLIMATIC SUMMARY

Table 1 shows 1961 through 1965 monthly precipitation and monthly mean temperatures at Aberdeen together with long-term averages. Precipitation during the wheat fruiting period — the period from heading to ripening — was higher in 1961, 1962, 1963 and 1965 than the long-term average, with 1963 and 1965 ranking 60 percent above normal. In the fruiting period of 1964, precipitation was about normal. Temperatures during the fruiting stage were above average in 1961 but below average the other 4 years. Daily weather records show several days in July 1964 with temperatures considerably higher than normal, however.

Table 2 shows 1961 through 1965 monthly precipitation and monthly mean temperatures at Tetonia together with long-term averages. Precipitation during the wheat fruiting period in 1961 was below normal but temperatures were above normal. In 1962, 1963, 1964 and 1965, precipitation during the fruiting period was above the long-term average. Most of the higher precipitation occurred early in the fruiting stage. Temperatures these 4 years for this stage were about normal.

Annual precipitation for the years 1964 and 1965 was approximately 3 inches more than normal for both Aberdeen and Tetonia.

Table 2. Tetonía monthly precipitation and monthly mean temperature, 1961 through 1965, plus monthly averages, 1915 through 1965.

Month	1961		1962		1963		1964		1965		Average 1915 - 1965	
	Prec.	Temp.	Prec.	Temp.	Prec.	Temp.	Prec.	Temp.	Prec.	Temp.	Prec.	Temp.
Jan.	0.00	17.0	0.80	9.2	1.48	10.2	1.59	12.1	2.13	19.9	1.05	15.1
Feb.	1.59	24.8	1.88	21.4	0.92	32.6	0.82	11.3	0.53	21.0	0.89	19.9
March	1.02	30.0	0.62	24.8	0.26	30.0	1.41	19.2	0.27	21.6	0.83	25.7
April	0.71	36.9	0.62	40.7	2.23	36.4	0.86	36.2	1.51	40.7	0.98	38.0
May	1.36	47.2	1.60	47.6	3.43	49.4	2.20	47.1	2.22	44.8	1.59	48.0
June	0.47	59.6	1.56	55.3	3.04	51.8	3.98	53.1	2.79	53.5	1.73	54.5
July	0.71	64.4	2.69	60.6	0.46	62.7	0.76	64.6	0.72	61.2	0.90	60.4
Aug.	1.31	64.8	0.50	59.9	0.67	62.6	0.91	57.8	1.33	59.0	1.10	60.7
Sept.	5.20	46.4	0.92	53.2	3.46	57.3	0.05	49.5	1.89	44.7	1.25	51.8
Oct.	1.65	39.6	0.42	45.8	1.02	48.0	0.97	43.5	0.33	44.0	1.05	42.2
Nov.	0.68	26.1	1.41	32.6	1.69	29.9	1.39	27.0	0.84	34.3	0.96	28.4
Dec.	1.88	14.8	0.25	24.1	1.41	16.8	2.29	19.7	0.82	20.1	1.08	19.2

WHEAT QUALITY

Hard red winter wheats of the 1961, 1962 and 1963 crops yielded good quality data (Table 3) associated with strong gluten characteristics (Fig. 1).

In 1964 and 1965, the wheats ranked much lower in quality with weak gluten characteristics and low sedimentation values. Water absorption was approximately 3 percent lower than the other two years. Flours yielded by the 1965 wheats were creamy-yellow in color, a deeper pigmentation than usual. The ash from these flours was gray-black rather than the usual gray-white. Bread baked from them averaged low in volume and had rough shred and inferior grain and texture.

The 1962 crop of hard red spring wheat had extremely weak gluten as indicated by the weak farinograph curve (Fig. 2) and the low average sedimentation value (Table 4). Bread baked from this wheat was not as good as expected. It was in some ways much like bread from hard red winter wheat.

Tests showed the quality of 1961 and 1963 spring wheats to be good with strong gluten characteristics.

Quality data from the 1964 and 1965 spring wheats were much the same as those from 1961 and 1963 except that the average water absorption of the flour was low—about 3 percent less than that of the other 3 years. Bread from the 1965 samples was superior to that from 1964, however. This 1965 bread had large volume and excellent grain, texture and color. It rated much higher than the farinograph curve predicted.

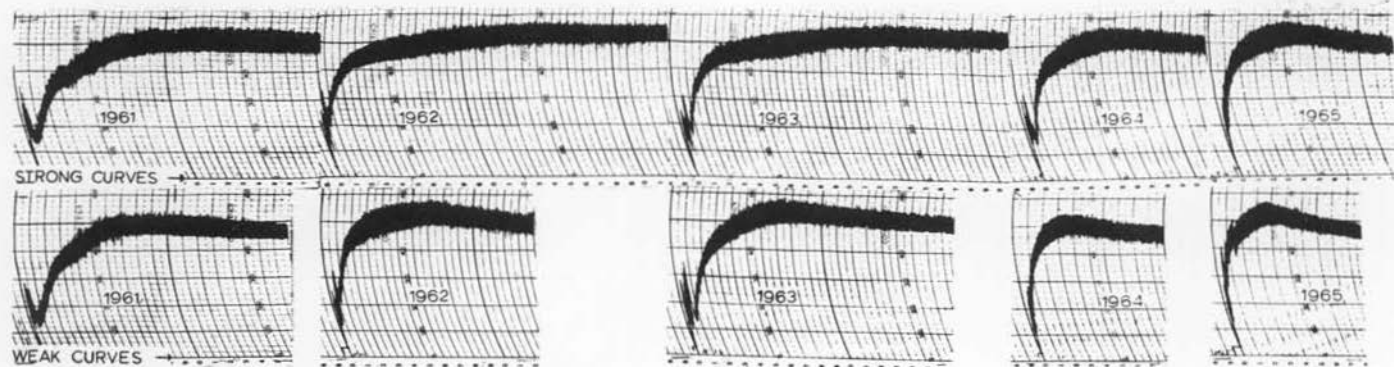


Figure 1. Hard red winter wheat farinograph curves 1961-1965

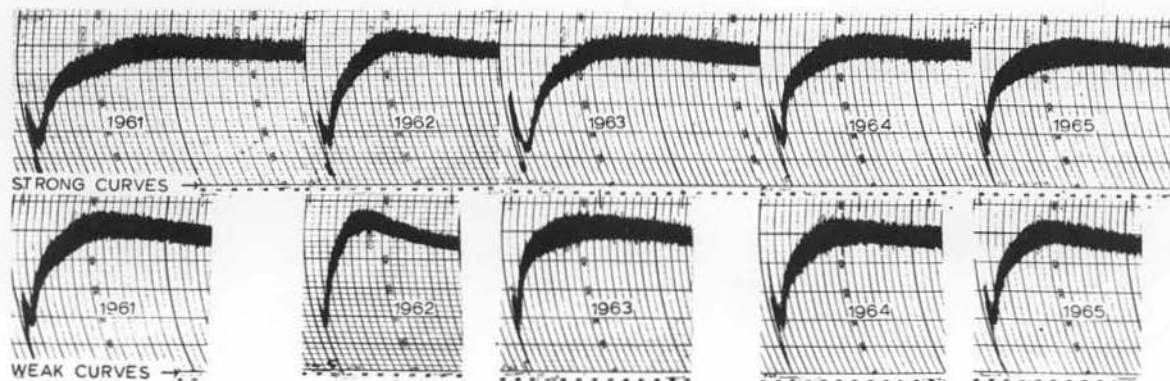


Figure 2. Hard red spring wheat farinograph curves 1961-1965

Table 3. Yearly averages of quality data on hard red spring wheat grown at 3 locations.

Year	Location	Wheat Protein	Sedimentation	Farinograph		Loaf Volume
				Absorption	Peak	
1961	Aberdeen	-----	---	-----	---	-----
	Tetonia	15.8	68	65.0	7.2	-----
	Twin Falls	-----	---	-----	---	-----
1962	Aberdeen	-----	---	-----	---	-----
	Tetonia	14.3	55	64.0	4.5	630
	Twin Falls	-----	---	-----	---	-----
1963	Aberdeen	13.7	42	65.0	4.5	650
	Tetonia	15.4	67	65.5	8.0	750
	Twin Falls	12.8	50	64.0	4.7	640
1964	Aberdeen	14.1	42	62.0	4.4	700
	Tetonia	14.0	60	62.5	5.0	670
	Twin Falls	13.3	38	61.0	4.7	-----
1965	Aberdeen	14.0	48	62.5	4.5	725
	Tetonia	14.3	56	61.6	5.1	740
	Twin Falls	13.3	42	60.0	4.0	700

Table 4. Yearly averages of quality data on hard red winter wheat grown at 6 locations.

Year	Location	Wheat Protein	Sedimentation	Farinograph		Loaf Volume
				Absorption	Peak	
1961	Aberdeen	14.0	64	65.0	12.0	-----
	Fairfield	15.6	67	62.4	7.4	-----
	Heglar	14.6	63	62.5	6.0	-----
	Preston	-----	-----	-----	-----	-----
	Tetonia	15.2	69	62.0	10.1	-----
	Twin Falls	11.9	43	60.5	4.0	-----
1962	Aberdeen	14.3	68	65.0	14.0	-----
	Fairfield	-----	-----	-----	-----	-----
	Heglar	10.3	48	59.4	2.6	-----
	Preston	15.1	67	64.9	10.4	-----
	Tetonia	14.8	67	63.5	7.1	700
	Twin Falls	9.1	35	59.0	2.2	-----
1963	Aberdeen	13.6	57	63.0	7.5	660
	Fairfield	13.0	62	62.2	5.7	650
	Heglar	8.6	26	-----	-----	-----
	Preston	-----	-----	-----	-----	-----
	Tetonia	15.0	67	62.5	9.0	720
	Twin Falls	12.2	50	-----	-----	-----
1964	Aberdeen	12.5	32	60.0	3.6	630
	Fairfield	14.8	69	59.2	6.5	700
	Heglar	8.7	21	-----	-----	-----
	Preston	12.8	43	60.0	5.0	640
	Tetonia	12.0	40	60.0	4.0	620
	Twin Falls	12.8	42	58.5	4.0	620
1965	Aberdeen	12.7	38	60.0	4.0	640
	Fairfield	-----	-----	-----	-----	-----
	Heglar	-----	-----	-----	-----	-----
	Preston	-----	-----	-----	-----	-----
	Tetonia	13.4	54	61.0	6.5	680
	Twin Falls	13.0	46	-----	-----	-----

LITERATURE CITED

1. Wise, Martin, Sneed, E. Marie and Pope, W. K. A modified Udy analyzer protein method. *Agron. Jour.*, 57:93-94. 1965.
2. American Association of Cereal Chemists, *Cereal Laboratory Methods* (7th ed.) The Association: St. Paul, Minn. 1962.
3. Wise, Martin, Sunderman, Donald and Sneed, E. Marie. Comparisons of the accuracy of macro, semimicro and micro sedimentation tests for wheat. *The Northwestern Miller*, 273, No. 6:48-52. 1965.