RESEARCH ARTICLE **(Open Access)**

Formation of Grain Quality in Bread Wheat Varieties under Mil-Garabakh Region of Azerbaijan: Az Wheat

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Abstract:

Grain quality in bread wheat varieties was studied under Mil-Garabakh region of Azerbaijan. It was revealed that in these conditions the gluten content was relatively high, while the quality of gluten determined by DCO and sedimentation index was low. Apparently, this is due to the fact that in Tartar AIA 3OC during grain ripening period temperature was high. Usually under these conditions, high bread baking quality of wheat grain was not formed. However, bread obtained from varieties Girmizi bugda, Azeri, Gobustan, Murov with high gluten content and low DCO had good quality.

Keywords: bread wheat, quality, sedimentation, gluten content, baking quality

1. Introduction

Advantage of varieties of intensive type compared with extensive type is that under optimal environmental conditions and good agronomic conditions they have high productivity. But, as usual, in unfavorable years they are inferior to varieties of the extensive type. So now all efforts of breeders are directed at increasing productivity of varieties under unfavorable climatic conditions [1, 9]. In addition, created modern varieties under extreme growing conditions should combine a number of features: high yield, ecological plasticity and high baking quality.

It is known that the formation of wheat quality depends on three factors, weather conditions, cultivation technology and genotype of variety [3, 4, 7, 8] .

According to Batalova GA (2006), the growth in production is not due to sown area, but due to the increase in yield, which is provided by a genetic potential of variety in combination with a scientific - based cultivation technology [2].

At higher protein and gluten content the role of varietal characteristics, different climatic conditions of cultivation and natural cultivation region are of particular importance [5].

It is known that the main parameters determining the technological characteristics of grain quality in bread wheat are the mass fraction of protein and crude gluten, as well as the quality of gluten. Direct method of evaluation of baking properties is a laboratory baking of bread with an assessment of its quality by volume, firmness, appearance, crumb and porosity. Unfortunately, in last years, in the country under unfavorable conditions during ripening period in bread wheat varieties quality of gluten varies greatly. Therefore, it is necessary to analyze the accumulated information on the nature of manifestation, as well as the inheritance of traits with the implementation of capacity of varieties in specific agro-ecological conditions.

Proceeding from the above, the main objective of our research was to study the grain quality indices, especially the baking quality of bread wheat varieties grown under Terter experimental station of Azerbaijan SR Crop Husbandry Institute.

2. Material and methods

Tartar experimental station is included into Mil-Garabakh soil-climatic zone of Azerbaijan and for the level of relative humidity belongs to the semi-arid zone. Moisture index is 0.10-0.15. Rainfall is 250-450 mm and evaporation is 600 mm. Here, the total amount of air temperature above 10^0C -3800 - 4700^{0}C, and the air temperature is 5 days. Dry winds continue up to 20 days. Zone refers to the midcontinental climate zone of irrigated agriculture.

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The research material included nineteen realized and promising varieties of bread wheat of intensive type.

Quality of grain and breads was determined by the standard technique [6]. Bread baking was carried out using dry yeast on 100g of the dough. Baking quality was determined on 5 -point scale.

3. Results and discussion

The results showed that the studied promising varieties of bread wheat differed in all studied parameters of grain quality.

Table 1. Grain quality of bread wheat varieties grown under Tartar Experimental Station

№	Varieites	1000 grains weight, g.	Vitreousness, %	Gluten, %	DCO	Sedimentation, ml	Grain type, g/l	Flour output, г.	Bread volume, см^3	Bread quality point	Protein ,%
1	Aran	41.6	52	28.0	104.0	28.5	779	714	550	4.3	13,7
2	Girmızı gul 1	38.4	62	28.0	85.5	27.0	791	719	400	4.3	13.7
3	Ugur	45.6	84	30.4	96.1	39.9	801	707	400	4.4	14.6
4	Zirva 85	41.6	92	30.4	93.6	31.5	809	640	470	3.6	14.0
5	Pirshahin 1	43.2	38	31.2	100.8	27.0	781	-	470	3.6	14.7
6	Nurlu 99	39.2	63	30.8	108.6	33.0	798	639	500	4.6	14.9
7	Gizil bugda	43.2	84	33.2	94.8	27.0	802	722	590	4.3	14.8
8	Murov 2	39.6	65	27.2	103.4	28.5	789	657	380	4.2	13.7
9	Azamatli 95	40.8	67	34.0	105.7	33.0	802	680	380	4.2	14.6
10	Yegana	35.2	80	32.4	105.9	36.0	775	635	450	3.6	15.7
11	Farahim	43.2	15	26.0	96.3	30.0	757	665	450	4.3	13.7
12	Shafag 2	42.4	92	30.0	103.3	21.0	790	600	320	3.4	15.5
13	Bayaz	38.0	77	32.8	99.4	33.0	790	604	400	3.7	16.4
14	Azeri	44.0	16	30.0	103.7	30.0	733	678	510	4.6	13.5
15	Ruzi-84	40.4	32	32.4	104.5	34.5	799	890	410	3.4	15.0
16	Fatima	41.6	59	24.0	88.0	34.5	799	696	500	4.6	13.7
17	Gobustan	43.2	32	31.2	105.7	38.0	799	691	500	4.8	15.3
18	Tale-38	41.6	30	29.2	93.9	27.0	701	867	490	4.2	15.2
19	Murov	45.6	77	33.2	101.4	49.2	787	704	590	4.6	15.7

1000 grain weight was high in all the studied varieties, except Yegana and Bayaz (35.2 and 38.0 g, respectively). All varieties, except Azeri had vitreous grain. The protein and gluten content was basically high, but some had satisfactory level. DCO in these varieties as an indicator of gluten quality was qualified as third and fourth quality classes. Sedimentation index was also relatively low. Analyzing these data could suggest that the baking quality of these varieties will be low. But tests showed that even at the lowest level of DCO (104.0) bread obtained from some varieties with 550 cm^3 volumetric output (Table 1). In Girmizi gul 1 variety, with a good indicator of the DCO (85.5), bread volume was 400 cm^3, while variety Aran with low DCO (104.0) bread volume was 550 cm^3. Furthermore, for the same protein content in the grain in both varieties baking quality was 4.3 points. From Table 1 it can be seen that the high content of protein and gluten is not always determining the quality of bread. So, Fatima, which is a promising variety, with low gluten content (24.0 %) and relatively low protein content (13.7%) had a bread with large volume (600 cm3) and high quality (4.6 points). Comparative study of varieties on the baking quality showed that a variety Gobustan with 500 cm^3 volume of bread, had 4.8 points for baking quality.

Bread wheat varieties Murov, Azeri and Nurlu 99 only 0.2 points inferior Gobustan variety for bread quality. That is, they can be grouped into same class for baking quality. Based on the foregoing, we consider it reasonable to study the correlation between these parameters in a set of varieties.

Analysis of the data showed that there was a medium connection between the gluten content and DCO index (r = +0,488), grain kind and vitreousness (r = +0,598), gluten and protein content (r = +0,688), while the connection between sedimentation indicator and bread volume was weak. In addition, no significant correlation was noted between the sedimentation and DCO index (r = 0.335).

Table 2. Correlation among grain quality indices

Indices	1000 grains weight, g	Vitreousness, %	Gluten, %	DCO	Sedimentation, ml	Grain type, g/l	Flour output, g	Bread volume, см^3	Protein, %
1000 grain weight, g	1								
Vitreousness,%	-0.184	1							
Gluten, %	-0.032	0.306	1						
DCO	-0.098	-0.098	0.488*	1					
Sedimentation, ml	0.223	0.109	0.306	0.159	1				
Type, g/l	-0.076	0.598**	0.220	0.050	0.248	1			
Flour output, rg	0.016	-0.206	-0.048	-0.159	0.172	-0.236	1		
Bread volume, см^3	0.353	-0.176	0.059	-0.047	0.335	-0.160	0.130	1	
Protein, %	-0.180	0.332	0.688**	0.348	0.307	0.073	-0.051	-0.072	1

Between the volume of bread and protein content there was insignificant negative correlation (r = -0,072). The same tendency was observed between gluten content and bread volume. Table 2 shows the correlations for all indicators of grain quality in bread wheat varieties of Institute of Agriculture.

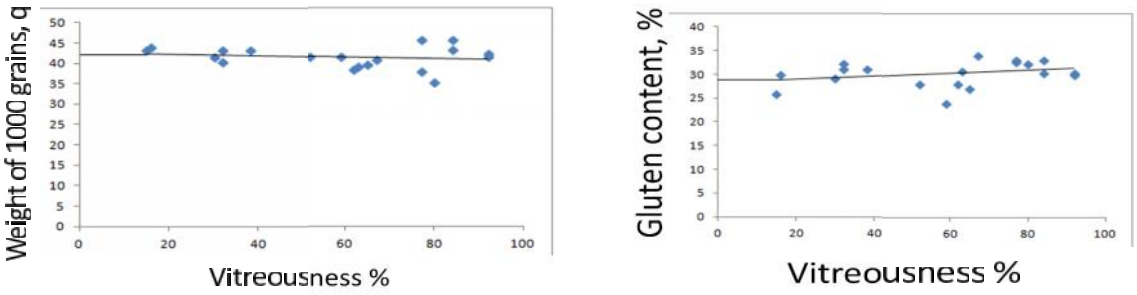

Figure 1. Distribution of bread wheat varieties depending on the vitreousness, 1000 grain weight and gluten content

On the basis of these data, the curves were created characterizing the distribution of varieties on the studied parameters. It can be seen that varieties depending on the weight of 1000 grains and vitreousness, also on vitreousness and gluten content were distributed scattered and correlation between these parameters was not observed (Fig. 1).

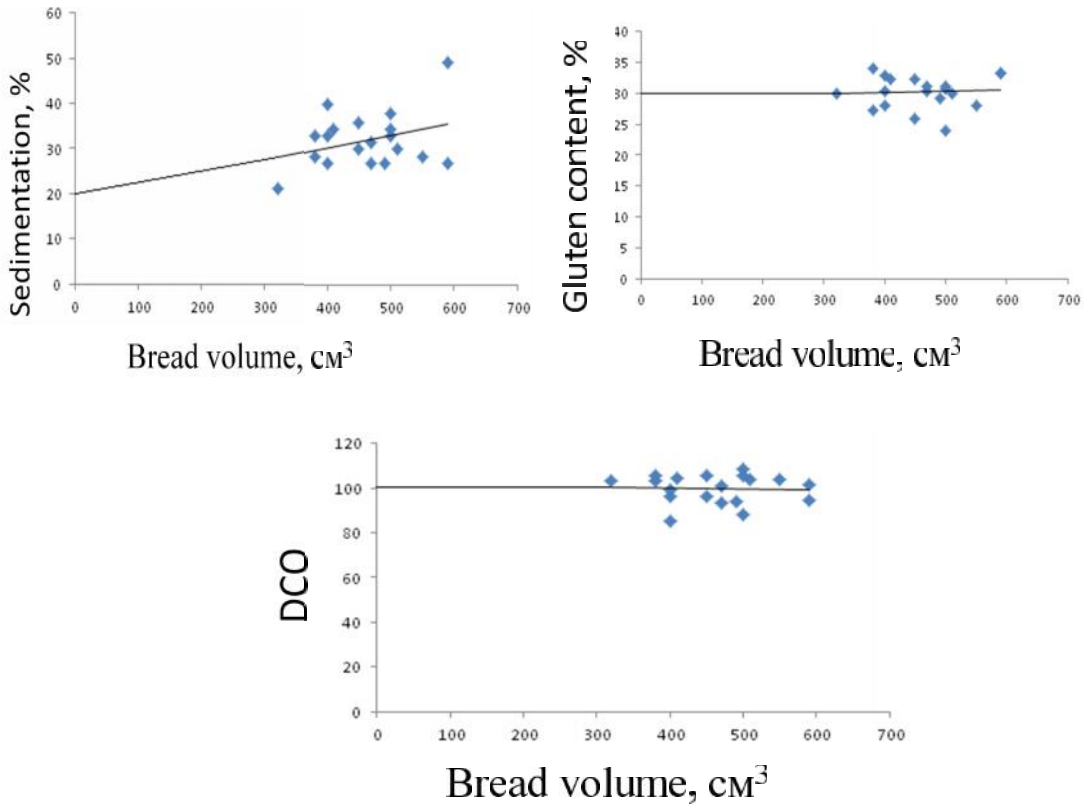

Figure 2. Distribution of bread wheat varieties according to bread volume depending on sedimentation, gluten content and DCO

Depending on the sedimentation index, gluten content, DCO and volume of bread varieties were distributed differently. So, depending on volume and DCO bread varieties were located close to each other, which mean proximity of bread wheat varieties for these indicators. There was a correlation between the sedimentation index and volume of bread. Between the gluten content and volume of bread in studied varieties correlation was not detected (Fig. 2).

4. Conclusion

Thus, from the foregoing it may be concluded that high gluten and the protein content does not provide bread with high volume and high quality. As already noted, period with 35^0C temperature continues only 5 days and they are observed in the grain filling period. Based on these data we can assume that low quality gluten in bread wheat varieties in Tartar ES associated with high temperatures during the ripening of grain.

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