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DETERMINATION OF PROTEIN VARIABILITY IN GRAIN OF INTERSPECIFIC WHEAT HYBRIDS (Tr.aestivum x Tr.durum)

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Abstract. This research was carried out at the experimental plots of the fields of the Agronomy Faculty of the Azerbaijan State Agrarian University, during 2013-2017. As a parent material for 50 combinations of hybridizations was used. In the F1 populations belonging to the abovementioned combinations, plant height, spike height, spikelet number per spike, kernel number and kernel weight per spike and 1000-kernel weight were determined and the hybrid vigor was calculated. Positive and significant differences varying among the combinations were found in the F_1 plants with higher values than the parent's average (heterosis) as well as in F_1 plants showing higher values than the superior parent (heterobeltiosis).

Keywords: *protein variability, wheat hybrid, hybrid vigor.*

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1. Introduction

Researchers choose the use of the hybridization process to enrich the embryonic plasma of local wheat varieties in order to create high-quality varieties. One of the most difficult issues in selection is the combination of high productivity with high quality. Many years of research have shown that it is important to obtain hybrids of this type and maintain the stability of their genotypes in order to overcome the existing problems. So in terms of productivity and product quality in selection work is considered expedient to use when selecting parents for hybridization adapted to the local environment as the mother form, ecologically and geographically distant as the father form and from genotypes that have positive traits and important characteristics that are not present in the mother.

Grain quality indicators are complicated features and are quickly exposed to environmental factors as well as pathogens, cultivation technology etc. They usually cause a number of difficulties in plant breeding (Varenitsa & Kochetygov, 1981).

According to the literature, the wide geographical and ecological diversity of nature, which changes under the influence of extreme factors of nature, leads to a decrease in the quality of wheat grain (Poladova, 2019).

The amount of protein is the most important indicator of quality. It is the basis of grain nutrition and baking. Eight of the 20 amino acids (lysine, tryptophan, etc.) that make up a protein are essential amino acids. They are not synthesized by humans or animals. The higher the amount of protein in the grain, which is one of the main quality indicators, the higher the quality of the products made from it, that is, protein determines the nutritional value of products made from it (Zhivotkov & Blokhin, 1990).

It is known that in the cross-breeding of hard and soft wheat, it is very difficult to match the characteristics of good grain quality and high productivity potential in the one genotype. In this regard, breeders are concerned about these important economic features seek to increase genetic variability by attracting donors from different wheat varieties to cross with certain sources. If the initial parent pairs are successfully selected, the spectrum of phenotypic variability during hybrid generational division in interspecific crossbreeding can be significantly expanded. You can get a successful adaptation of their productivity and quality traits. However, the work done in this direction is very small due to its complexity. For example, to determine the variability of grain quality and hereditary regularity, using certain crossover systems in combination to develop optimal methods for obtaining new farm valuable forms during interspecific hybridization and then it is necessary to carry out numerous biochemical analyzes by special methods (Haciyeva, 2018).

2. Materials and methods

Qirmizi bughda, Parzvan-1, Sheki 1, Azamatli 95 and Murov soft wheat varieties and Karabakh, Shiraslan-23, Alinja-84, Garagilchig and Barakatli-95 hard wheat varieties will be used as research material. Hybridization was carried out by setpross method. The research was conducted in the experimental field of the "Grain and legumes" field laboratory of ASAU in the Ganja-Gazakh zone.

The resistance of the hybrids to bending was evaluated. The seeds of the second generation of the main spikes of each selected healthy plant obtained from interspecific hybridization were sown in the fall to obtain the third generation.

Description of parental forms and hybrids, as well as spike and seam analysis, mathematical calculations were carried out according to the generally accepted methodology.

F_3 seeds were sown and phenological observations were made. After harvesting, spike and seam analyzes were performed. Good constants are chosen over bad ones. The study of the variability of quality traits in the first two generations of wheat hybrids was based on the arithmetic mean and analysis of their parent pairs.

The study of the ability to combine parental forms consists of several stages: the selection of a hybridization scheme, the acquisition of hybrids, their statistical analysis and testing.

Seeds of the analyzed main spikes of F_1 and F_2 plants were sown to obtain F_2 and F_3 forms. Agro-technical measures were taken in time, fertilizers were given and weeds were cleaned.

Harvesting was done manually, provided that the roots were preserved. Hybrid generations (F_1 and F_2) were planted according to the following scheme: P_1 - F - P_2.

3. Results and discussion

One of the main issues of our research is to determine the selection value of positively transgressive forms according to the amount of protein in the grain of hybrids obtained during the crossing of soft and hard wheat varieties.

Analysis of the obtained results shows that F_2 seeds (taken from different plants of F_1) differ significantly from each other in terms of protein content. Depending on the combination of crosses, the variability of these indicators was 2.3-10.9%. The

determination of the degree of dominance (hp) showed that, the amount of protein in the grain is mainly passed from generation to generation by type with superior dominance (14 combinations), with a small amount of complete and incomplete dominance according to these characteristics, by type by best (3 combinations) or worst (2 combinations).

Depending on the direction of crossover, some combinations have been found to vary in the amount of protein in the grain. Thus, the amount of protein in the combination of Khirmizi bughda 1 x Karabakh was from 13.4 to 21.5% for families (difference 8.1%), and vice versa in the combination to 18.6 ... 20.9% (difference 2.3%). At the same time, in the spectrum of variability of this sign, the difference between the combinations of Khirmizi bughda 1- Alinja 84 plain and vice versa was not so great. (11.7 ... 20.4%, difference 8.7% and 11.6 ... 18.9%, difference 7.6%).

At the time of crossing appeared families with very little protein compared to parent couples (10,3...12,3 %), also families with very high protein content (20,4...22,2%).

The difference in the amount of protein in the grain of interspecific hybrids is due to the polymer inheritance of this trait.

Plants with 20.3-22.2% protein were obtained in the 10 combinations which we studied. Much number of generations of hard and soft wheat varieties of F_2 plants (seeds of F_3) has high protein content in the grain. The maintenance of a high degree of seed protein in the offspring indicates a positive transgression due to this feature.

Table 1. Heredity of protein content in the grain of intercropped wheat hybrids (F_2)

Hybridization combination	Grain protein content parameter, with %				
	Ẍ ♀	Ẍ ♂	F_2		
			Ẍ	lim	Hp
Khirmizi bughda 1 x Karabakh	14,8	17,5	17,9	14,7-21,2	6,5-1tdə
Khirmizi bughda 1 x Shiraslan 23	14,8	15,3	16,0	11,7-20,4	8,7-3,8 yd
Khirmizi bughda 1x Alinja 84	14,8	12,8	15,1	10,3-17,7	7,4-1,3 yd
Khirmizi bughda 1 x Karaqilciq 2	14,8	12,4	17,5	11,3-22,2	10,9-3,2yd
Khirmizi bughda 1 x Barakatli 95	14,8	17,8	18,6	13,4-21,4	8,0-1,5 yd
Shaki 1 x Alinja 84	12,6	15,3	12,7	10,4-14,1	3,7-0,95 tda
Shaki 1 x Karabakh	12,6	17,8	18,2	11,5-21,3	9,8-1,1 yd
Parzvan 1 x Karabakh	14,5	17,8	17,0	12,8-21,7	8,8-0,5 ndə
Karaqilciq 2 x Khirmizi bughda 1	17,5	14,8	18,1	15,6-20,8	5,2-0,5 yd
Shiraslan 23 x Khirmizi bughda 1	12,8	14,8	16,3	10,8-19,3	8,5-2,5 yd
Alinja 84 x Khirmizi bughda 1	15,3	14,8	16,7	11,6-18,9	7,3-6,6 yd
Karabakh x Khirmizi bughda 1	17,8	14,8	18,6	18,6-20,9	4,3-1,5 yd
Shiraslan 23 x Parzvan 1	12,8	14,5	16,0	15,1-18,1	3,0-2,8 yd
Karaqilciq 2 x Parzvan 1	17,5	14,5	15,3	13,8-16,9	3,1-0,3 nda
Barakatli 95 x Parzvan 1	12,4	14,5	14,9	12,1-18,9	6,8-1,4 yd
Alinja 84 x Parzvan 1	15,3	14,5	16,8	15,8-10,4	4,6-4,7yd
Shiraslan 23 x Shaki 1	12,8	12,6	14,7	13,1-15,6	2,5-2,0 yd
Alinja 84 x Shaki 1	15,3	12,6	16,5	15,4-27,7	2,3-1,9 yd
Karabakh x Azamatli 95	17,8	13,1	17,7	14,1-20,3	6,2-0,9 tdə

Table 2. Amount of protein, lysine and tryptophan in the grains of selected lines of hard and soft wheat (F_3)

Hybrid combinations and number of lines	Phenotypes of plants	Quantity by total dry weight (%-lə, moisture-10%)		
		Protein	Lizin	Triptofan
2(1/3-3)-6	Soft	19,95	2,73	90
1(1/3-3)-3	Soft	16,53	2,56	60
1(1/3-3)-4	Soft	15,26	2,65	70
1(1/3-3)-5	Soft	18,68	2,52	55
13(1/3-2)-3	Hard	20,64	3,98	75
17(1/4-3)-3	Hard	16,97	3,38	60
18(1/4-4)-1	Hard	16,40	3,84	60
20(1/4-6)-2	Hard	19,88	2,78	70
22(2/3-3)-5	Hard	17,41	2,99	95
24(2/3-5)-9	Hard	15,70	3,54	75
40(2/4-1)-9	Hard	17,1	2,97	60
67(3/3-3)-4	Hard	16,27	2,67	50
67(3/4-3)-4	Hard	16,90	2,97	65
73(3/4-9)-1	Soft	15,51	3,87	60
74(3/3-1)-4	Soft	16,46	3,13	80
76(4/3-2)-4	Hard	24,00	3,53	100
80(4/3-8)-1	Soft	17,35	2,93	80
80(4/3-8)-3	Soft	15,89	2,45	80
80(4/3-8)-9	Hard	18,04	3,41	65
88(4/4-1)-3	Soft	19,95	4,22	66
89(4/4-5)-3	Soft	15,45	2,90	70
97(5/3-1)-2	Hard	18,68	3,23	80
99(5/3-3)-2	Soft	14,22	2,34	90
99(5/3-3)-3	Soft	15,64	2,50	90
99(5/3-3)-4	Soft	16,14	3,61	80
99(5/3-3)-8	Soft	16,71	2,55	80
109(5/3-15)-5	Hard	13,68	2,96	75
110(5/3-16)-2	Hard	18,36	2,88	80
112(5/3-19)-5	Hard	16,97	3,55	75
113(6/4-1)-4	Hard	21,15	3,16	80
116(6/4-2)-2	Hard	20,64	3,23	90
32/4-1	Hard	22,29	3,23	90
32/4-2	Hard	20,64	3,23	90
32/4-4	Hard	20,32	4,06	90
32/4-5	Hard	22,23	3,89	90
33/4-5	Hard	21,72	3,76	80
33/4-6	Hard	20,64	3,96	70
33/4-8	Hard	22,29	3,96	95
33/4-9	Hard	22,60	4,09	80
35/3-2	Hard	21,40	3,36	80
35/3-4	Hard	21,34	3,27	90

4. Conclusion

Due to the interspecific hybridization of hard and soft wheat, many new forms have emerged.

Most of them are very important in terms of selection. Thus, it is very important to get families with high amounts of protein and lysine.

As a result reciprocal crossings it has been found out that the general combinational ability at a grade of Alindzha-84 on all elements of productivity, at a grade of Karabakh on 6, and at a grade of Karakılcık-2 on three elements of productivity was average or high. But at a grade of Alindzha-84 unlike two other grades the general combinational ability on plant height was low. Short stature, stability to drowning can play an important role in selection. By results of the spent researches the general combinational ability had stable estimations at grades of Alindzha-84, Kırmızı buqda 1, Sheki-1 and Bereketli-95.

In modelling populations and hybrids at definition genotypic variability have been found out defined similarity. In modelling populations at creation population hybrids, as a result of crossing of parental forms, forecasting of degree of variability is possible. As a result of research by a method of interspecific hybridization the selection materials consisting of families with positive signs have been created. As a result of interspecific hybridization of firm and soft wheat a considerable quantity of new forms has been received. Since reception of families with the high maintenance of fiber and lysine is of great importance many of them are important in the selection process.

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