

Original Research Article

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Estimation of Genetic Potential of Grain Quality of Old Spring Popular Grass Varieties and Isolation of Prospective Genotypes for Crossing

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ABSTRACT

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The article presents the results of assessing the genetic potential of grain quality of ancient varieties of spring bread wheat for the selection of promising genotypes in practical breeding. The study found that ancient varieties of common wheat are characterized by a wider variety in grain hardness. The results of a comparative assessment of the diversity of ancient varieties of different genetic origin showed that Zakhnabad and Hibit varieties are heterogeneous in grain hardness. In the conditions of Pasdargom districts, these varieties were characterized as hard-grained (IT = 78 and 73, and in Samarkand, as semi-soft-grained (IT = 45 and 52). Among the studied varieties, the highest grain hardness index was characterized by Kairaktash (IT = 81), Khupar) (IT = 82), Bardosh (IT = 79), Zakhnabad (IT = 78) In general, 96% of all varieties belong to the class of hard-grained medium-hard grained, 2% to mixtures and 1.3 to the class of semi-soft grained.

Introduction

Spring soft wheat is the leading grain food crop in the Central Asian region and is a source for the production of bread and bakery products. However, despite the important agricultural value of wheat, the baking quality of newly created and zoned varieties of grain remains low (1). The baking quality of grain is an integral feature that depends on the genotype of the variety (2, 3), soil fertility and meteorological growing conditions (4, 7), as

well as the influence of pests (8). The variety of soil and climatic conditions in the grain-sowing zones of Uzbekistan requires the creation and introduction into production of adaptive and highly productive varieties of spring bread wheat that give stable yields of good quality. At the same time, special attention is paid to the search for source material, the study and selection of schemes for crossing. Consequently, the newly created material is evaluated according to a complex of economically valuable traits at different

stages of the breeding process. The complex of technological and biochemical qualities of grain is by its nature very complex. No less difficult is the task of combining in good quality varieties with high yields (9).

The quality of grain and wheat flour is important breeding characteristics when creating varieties (10-11). Therefore, the modern world food production makes various demands on the technological properties of grain and flour.

To satisfy them, it is necessary to create and introduce into production universal wheat varieties resistant to extreme conditions in zones that stably preserve the genetic potential of productivity and grain quality (12). In this regard, one of the directions in the breeding of soft winter wheat is the creation of new varieties that combine in one genotype high yield and grain quality with adaptability (13, 14). To create such varieties, special attention is paid to the search for source material, the study and selection of crossing schemes.

At the same time, great opportunities for the selection of promising forms are given, in particular, by the determination of indicators of grain quality, protein-gluten complex, flour strength, baking advantages and interaction of qualitative characteristics. In this regard, the assessment of the genetic potential of grain quality of ancient varieties of spring bread wheat and the identification of promising genotypes is very important.

The aim of the research was to identify varieties-sources of high protein and gluten content for inclusion in the crossing program.

Materials and Methods

In order to identify high quality source varieties in 2017-2018. In the fields of the farm "Bek-Dil-Beh-Shokhsuvoriy" of the Pastdargom district of the Samarkand region

(steppe zone h = 644 m above sea level 39⁰39¹ N and 66⁰40¹ E), studies were carried out to study the genetic potential of grain quality old varieties of spring soft wheat. Subcollections of local ancient varieties of spring bread wheat were used as a starting material for the study.

The subcollection contained 9 varieties of common wheat, of which 4 are varieties of the IG and EPB AN RU selection and 5 from the collection of our own harvests.

The sowing of the varieties was carried out in the second decade of October at the optimum sowing time for the zone. The varieties were studied in a competitive trial on plots of 25 m² in duplicate. Evaluation of varieties by grain quality was carried out in accordance with the methods of national standards of the Russian Federation according to the following indicators: grain nature (15), quantity and quality of gluten (16), physical properties of the dough on a farinograph (17), mass fraction of protein in grain (18) and methodology of state variety testing (19).

The data obtained were processed according to Dospekhov (20) using the AgCStat program for Microsoft Office Excel.

Results and Discussion

In order to identify varieties-sources of grain quality in 2017-2018 in the steppe zone of the Pastdargom district of Samarkand region, a subcollection of local ancient varieties of spring bread was studied. The subcollection contained 9 varieties of common wheat in total, of which 4 were varieties of the IG and EPB (Institute of Genetics and Experimental Plant Biology) selection and 5 were from the collection of our own harvests.

Evaluation of varieties by grain hardness. As a result of assessing the old varieties of spring soft wheat by grain hardness, it was revealed that they mainly belonged to the group of

medium and hard grain. The Ob sample was identified as “soft-grain + mixture”, since the range of the hardness index is 38-56 units. It should be noted that the varieties Zakhnabad and Khibit turned out to be heterogeneous in grain hardness. In the conditions of the Pstdargom district (without watering), these varieties were characterized as hard-grained (IT = 78 and 73), and in the conditions of Samarkand, as semi-soft-grained (IT = 45 and 52).

Table 1 shows the results of the analysis of varieties by grain hardness, diameter and grain weight of ancient varieties of spring soft wheat.

The data given in Table 1 show that the studied varieties differ from each other in terms of grain hardness. Based on the data presented in Table 1, it can be concluded that all studied varieties were mainly classified as hard-grain, with the exception of Vatan, which is marked as soft-grain. It should be noted that among the studied varieties, the highest grain hardness index was characterized by Kairaktash (IT = 81), Khupar (IT = 82), Bardosh (IT = 79) and Zakhnabad (IT = 78).

In general, 96.3% of all varieties of the studied subcollection of local ancient wheat belong to the class of hard grain, 2% to mixtures and 1.3 to the class of semi-soft grain.

Grain quality

The results of studies on the characteristics of grain quality of ancient varieties of spring soft wheat are shown in Table 2. From the data given in table 2 it follows that the varieties differ among themselves in terms of grain quality. According to the classification of A. Abugalieva and A. Morgunov, hard-grain varieties include those in which this indicator is 100-66 microns. The results of a comparative analysis of ancient varieties of spring soft wheat showed that they are characterized by a variety of physical indicators of grain quality. So, for example, the soft-grain varieties Vatan and the medium-hard grain varieties Ok marvarid and Kairaktash are characterized by a comparatively reduced vitreousness of 56 and 60, respectively. In addition, the marked varieties that are classified as hard-grain, but are characterized by a low glassiness.

Table.1 Assessment of spring soft wheat varieties according to grain hardness indicators (rainfed, average for 2017-2018)

Variety	Grain indicators		
	Grain hardness (dav), mk	Diameter, mm	Mass, mgr
Vatan	53+14	2,51+0,2	28,4
Obi	74+15	2,71+0,4	33,6
Hibit	73+15	2,67+0,27	33,3
Zakhnabad	78+15	2,69+0,3	33,8
Hupar	82+17	2,65+0,3	34,5
Ok marwarid	75+16	2,73+0,3	32,8
Kairaktash	81+14	2,60+0,3	29,6
Pahlavon	71+17	2,68+0,31	31,6
Bardosh	79+18	2,72+0,3	32,4
Min	71	2,51	28,4
Max	82	2,72	34,5

Table.2 Characteristics of grain quality indicators of ancient varieties of spring soft wheat (rainfed, on average for 2017-2018)

Variety	Grain nature, g / l	Weight of 1000 grains, g	Vitreousness, %	Mass fraction, %	
				Squirrel	Glutenfree
Vatan	814	34,8	58	13,8	31,4
Obi	828	35,6	80	14,1	32,1
Hibit	818	39,6	64	13,7	31,5
Zakhnabad	818	37,5	62	15,2	33,5
Hupar	838	38,0	62	16,4	34,6
Ok marwarid	871	38,2	56	15,7	33,7
Kairaktash	810	36,2	60	13,2	30,5
Pahlavon	815	33,4	73	14,1	30,2
Bardosh	824	38,2	63	15,5	33,6
Min	810	33,4	58	13,2	30,2
Max	871	39,6	80	15,7	34,6
HCP _{0,5}	12,38	3,8	0,16	0,16	0,24

Table.3 Source varieties in terms of high quality flour (average for 2017-2018)

Variety	Origin	Indicators		
		S _{MJ}	P, %	S:P
Hupar	SamSU	77,2	16,4	4,7
Okmarwarid	IG and EPB	64,4	16,2	4,0
Bardosh	IG and EPB	72,1	16,7	4,3
Kairaktash	IG and EPB	68,9	14,3	4,8
Min		64,4	14,3	4,5
Max		77,2	16,7	

These varieties include: Zakhnabad (62%); Khupar (62%); Bardosh (63%). A soft-grained variety with a good glassiness Vatan (58%) was also revealed.

In general, the variation of average values for vitreousness over the years of the study was 58-60%. At the same time, the distribution according to the classification of grain hardness and vitreousness is as follows: “hard-grained-glassy” - grade 6 (Khupar, Kairaktash, Obi, Bardosh, Pakhlavon, Hibit) and “medium-hard-grained-glassy” - 2 grades (Obi, Zakhnabad), “mixture-glassy” - 1st grade (Vatan).

It is quite obvious and proved by many studies that the quality of varieties is formed under the

influence of a complex of factors, which, depending on the conditions and genotypic characteristics of the variety, make a certain contribution to the formation of grain.

In the current conditions of 2017, the decisive indicator for most varieties in the formation of grain quality was the content of protein and gluten. Varieties in which the protein content in the grain was from 14 to 16% on dry land, and the gluten content from 30 to 34% were identified as varieties-sources of grain quality. However, it should be noted that despite the general background of temperature and water conditions, each variety showed its own peculiarity. These varieties include - Zakhnabad, Khupar, Ok marwarid, Pakhlavon and Bardosh (Table 2). Noteworthy is the high

background of the steppe zone and meteorological features of 2017-2018 growing years for the selection of high-quality varieties in crossing programs. It should be noted, however, that in this vegetation year, all studied varieties were characterized by high values >30% in terms of gluten quality. At the same time, about 15% of varieties had gluten of the 2nd quality group (30-34 units of IDK). Judging by the data of the 2017 harvest in rainfed conditions, all the studied varieties of spring soft wheat had a high background for the selection of grain quality. The extreme conditions of the steppe zone turned out to be a provocative background for the realization of the genetic potential of varieties. The relatively best varieties with a fairly high gluten content have been identified.

On the basis of comparative analyzes, it can be considered proven that, under the conditions of the steppe zone, in spring bread wheat, gluten, of course, was formed more with an average IDC =30 ye. Consequently, the degree of selection of the best genotypes on the bogara was much greater. The results of a comparative analysis of ancient varieties of spring bread wheat in terms of grain quality showed that varieties differ in genetic potential. However, the position of the varieties depends on the parameters of grain quality and growing conditions. The sedimentation method is the most informative for assessing the genetic potential of grain quality. The sedimentation method very accurately captures the differences between varieties, and its indicator correlates well with the physical properties of the dough and the baking qualities of the grain. The sedimentation index (S) is complex, characterizing both the content and quality of the protein.

Over the years of research in the steppe zone of the Pastdargom district of the Samarkand region, the maximum grain quality indices were obtained for the Kairaktash variety (4.8)

and the Khupar variety (4.7) (Table 3). Assessment of the protein quality index made it possible to identify promising varieties from the collection nursery for this trait: Khupar (P = 16.4), Ok marvarid (P = 16.2), Bardosh (16.7).

As a result of the studies, a close correlation of the sedimentation index with the gluten content ($r = 0.62 + 0.03$) and the protein content in the grain ($r = 0.64 + 0.04$) was revealed.

Local ancient varieties of spring bread wheat of various ecological and geographical origin in the rainfed conditions of the Pastdargom region of the Samarkand region is capable of forming grain with a high protein and gluten content. The source varieties have been identified by protein and gluten content, which, it is advisable to include in the hybridization program.

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