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ASSESMENT OF BIOMORPHOLOGICAL TRAITS IN DURUM WHEAT OF DIFFERENT ORIGIN

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Abstract. In the article, a total of 55 (8) local and (47) introduced durum wheat genotypes were used to evaluate the genetic parameters of some morphological and physiological traits. The research was conducted in the Field Laboratory of Grains and Legumes of Azerbaijan State Agrarian University in 2021-2022. In this study several phenological development phases of wheat genotypes structural elements of yield as plant height (cm), spike length (cm), number of spikes in the main spike (number), number of grains in the main spike (number), weight of 1000 grains (g) is comparatively discussed in detail. Introduced genotypes have been shown to have more local effects on genotypes.

Keywords: *Durum wheat, genotype, morphological index, yield components, grain yield.*

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1. Introduction

Durum wheat (Triticum turgium L. var. durum) is the second most important cultivated wheat species in the world next to bread wheat (Pena *et al*., 2002). Durum wheat (Triticum durum Desf.), an allotetraploid (2n = 4x = 28, AABB), is a major crop worldwide, mainly cultivated in the Mediterranean basin and is the second most important wheat species (Nazco *et al*., 2012). Durum wheat is widely used in a variety of products, including long and short-dried pasta, fresh and puff pasta, bulgur and bread (Wang *et al*., 2021). Agromorphological characterization is the first step toward the utilization of genetic resources in plant breeding programs. Several studies have characterized durum wheat collections by both morphological traits to highlight differences due to the history of durum wheat (Shaygan *et al*., 2021). Wheat is one of the agricultural plants with a great role in terms of food security and is cultivated in large areas around the world. Food security of a rapidly growing population is one of the most pressing global problems at present (Mammadov *et al*., 2008). Today, CIMMYT and ICARDA conduct research aimed at improving the productivity of wheat, barley and legumes to ensure global food security and reduce poverty. It is not accidental that in recent years, important decisions have been made at the state level and a system of measures has been implemented to increase the productivity of wheat. To obtain high-quality grain yield from wheat genotypes under field conditions, cultivation

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factors should be used correctly. Thus, the sowing rate and other factors included in the cultivation factors are of great importance (Mustafayev, 2002). Increasing grain yield (GY) is the major focus of most breeding programs, while improving grain quality parameters is often a secondary objective (Michel *et al*., 2019). In addition, a positive correlation was found between the number of spikelets per spike and the length of the vegetative phase. Regarding the different responses of spike and spike characteristics to water deficit, many researchers have reported that water limitation at different growth and development stages affects the number of total and fertile spikes per spike and the number of flowers per spike (Casati *et al*., 2000).

2. Material and Methods

The present study was conducted at Azerbaijan State Agrarian University and Grain and Legumes Laboratory. The study was carried out in 2021-2022. The experimental material was comprised of 77 durum wheat genotypes which were planted in randomized. In present study, grains of 55 durum wheat genotypes from including (8 local and 47 introduced materials). Samples were sown by hand in November. Necessary agrotechnical maintenance of the crop was done. Under field conditions, phenological observations were made according to Cooperman (1984) starting from emergence to the full ripening phase. The field experiments were based on the scheme provided by the recommendations of the international selection organization ICARDA. The lifestyles of the plants were determined visually and calculated according to the yield obtained from the field. The main goal of the research work is to evaluate the biomorphological characteristics of local and introduced genotypes.

Table 1. Grain yield and yield components of durum wheat (2021/2022)

№	Genbank number	Origin	Plant height, cm	The length of the spike, cm	The length of the main spike, cm	The spikelets per spike, number	The weight of grains in the main spike	1000 grain weight, g
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	GDP-388	USA	88	6	7	17	1,2	36,2
2	GDP-395	ESP	135	8	8	17	1,5	44,1
3	GDP-397	İND	135	7	9	22	2	34,5
4	GDP-403	ALG	82	8	8	17	2,3	33,9
5	GDP-417	ICARDA	85	7	7	14	0,9	42,7
6	GDP-419	İCARDA	69	8	8	20	1,6	39,3
7	GDP-420	ICARDA	75	8	8	21	1,5	36,5
8	GDP-422	ICARDA	96	6	5	18	2,6	33,7
9	GDP-457	ICARDA	86	9	7	22	2,9	42,5
10	GDP-466	ICARDA	80	5	8	14	1,3	41,7
11	GDP-469	ICARDA	79	7	6	14	1,5	39,8
12	GDP-501	FRANCE	99	10	7	23	1,3	36,8
13	GDP-503	FRANCE	95	9	8	21	1,5	46
14	GDP-505	FRANCE	93	9	9	18	2,0	42,3
15	GDP-512	FRANCE	114	9	9	20	2,6	50,3

16	GDP-534	FRANCE	96	8	8	18	1,9	45
17	GDP-535	FRANCE	90	10	11	21	1,6	42,9
18	GDP-537	FRANCE	70	11	11	18	1,9	52,3
19	GDP-551	ETH	75	8	8	19	1,9	39,8
20	GDP-560	TUR	86	8	9	18	2,4	41,6
21	GDP-566	OMN	89	9	8	20	2,2	51,3
22	GDP-574	ESP	140	11	11	25	1,8	34,9
23	GDP-590	SYR	78	8	7	14	1,4	42,6
24	GDP-597	IRN	93	8	8	16	2,9	45,9
25	GDP-609	TUN	137	9	9	27	2,6	48,6
26	GDP-611	IRQ	84	10	11	24	1,8	52,3
27	GDP-647	TUN	115	10	10	21	0,6	56,3
28	GDP-664	ETH	78	9	8	18	1,5	49,8
29	GDP-669	CYP	99	8	8	22	2,4	51,3
30	GDP-671	TUN	76	6	6	14	1,6	38,4
31	GDP-682	IRQ	52	8	8	18	1	39,9
32	GDP-684	IRN	73	8	7	16	1,2	49
33	GDP-694	GRC	74	9	9	18	1,5	51,3
34	GDP-700	IRQ	72	7	8	20	2,1	42,6
35	GDP-701	UZB	126	10	11	22	2,3	50,6
36	GDP-705	UZB	133	9	9	20	1,6	46,8
37	GDP-737	UZB	84	9	7	16	1,4	49,6
38	GDP-738	ITA	68	8	8	16	1,3	53,6
39	GDP-741	TUN	89	9	9	72	3	44,6
40	GDP-748	IRN	133	8	6	16	1,7	49,8
41	GDP-761	TUN	70	8	8	18	0,9	45,9
42	GDP-762	IRN	98	5	6	14	1,6	55
43	GDP-332	ESP	85	6	6	21	1,7	40,1
44	GDP-341	FRA	96	7	8	18	1,9	36,5
45	GDP-353	İTA	69	8	8	22	2,5	39,8
46	GDP-375	ITA	85	9	9	17	1,7	43,5
47	GDP-376	ITA	93	6	6	22	1,5	38,5
48	Gəncə-1	GANJA	83	8	8	17	1,6	43,7
49	Gəncə-2	GANJA	94	8	7	16	0,7	51,3
50	Gəncə-3	GANJA	78	6	8	18	1,2	39,4
51	Gəncə-4	GANJA	77	8	8	18	1,7	44,7
52	Gəncə-5	GANJA	130	9	10	18	2	49,3
53	Gəncə-6	GANJA	135	8	8	22	1,6	35,1
54	Gəncə-7	GANJA	126	8	9	18	1,9	36,2
55	Gəncə-8	GANJA	85	7	8	12	2,2	49,3

3. Results and their Discussion

During the three-year period of the experiment it was found that height productivity in wheat plants is one of the important morphological traits that play a key role. In the conditions of Azerbaijan, the optimal height of a wheat plant can be considered 80-100 cm. Biomorphological indicators of local and introduced durum wheat genotypes were comparatively studied (Table 1). The tallest sample of GDP-547 was 140 cm and among local samples, Ganja-6 was 135 cm and Ganja-5 was 130 cm. The number of productive stems in introduced genotypes was between 2-11 and in local genotypes, 6-10. The number of joints was between 3-5 in both samples. The morphological characteristics of flag leaves are one of the most important determinants of plant architecture and yield potential (Sharma *et al*., 2003). From the morphological indicators of the spike, the length of the spike was 5-11cm. The number of spikelets in the spike fluctuated between 12-24. The number of grains in the main spike was 0.9-2.9. The weight of 1000 grains was GDP- GDP-647 (56,3), Ganja-5 and Ganja-8 (49,3). Cluster analysis was performed to reveal the genetic relationship and identity between the local and introduced durum wheat genotypes we studied. Cluster analysis was performed based on biomorphological markers using the SPSS software package and the dendrogram constructed based on cluster analysis of 55 durum wheat genotypes revealed 5 different plant groups (Figure 1). As can be seen from the dendrogram, cluster I included 16 wheat genotypes, cluster II 1, cluster III 16 and cluster IV 1 and the largest group included 21 wheat genotypes in cluster V, which in turn is divided into two subgroups (V a and V b). Subgroup V a is divided into 15 subgroups and V b is divided into 7 subgroups.

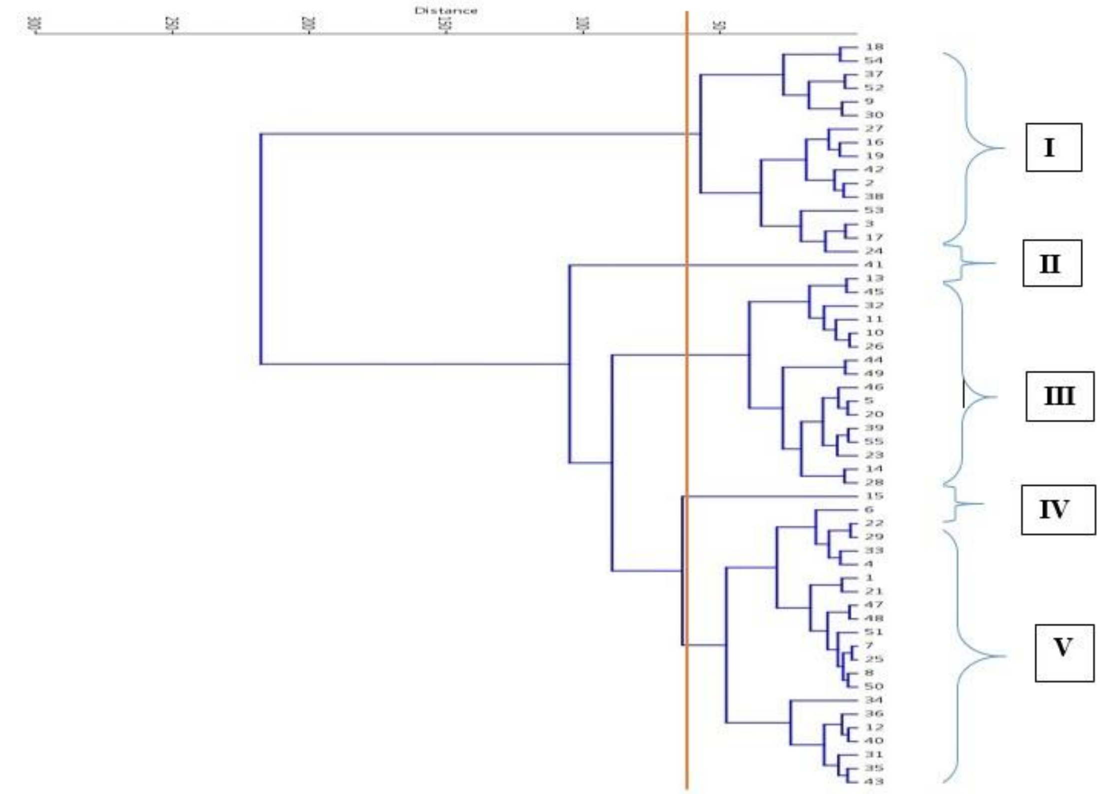

Figure 1. Dendrogram showing genetic similarity of durum wheat genotypes based on morphological marker analysis

Combining a large number of plant samples in one group allows us to evaluate them as similar genotypes. As expected, cluster analysis distinguished most of the studied durum wheat genotypes, no genotypes showing 100% genetic similarity among themselves were recorded. Clusters II (41) GDP-741 TUN and IV (15) GDP-457 FRANCE included 1 sample. I cluster is divided into two subgroups I a and I b and they are divided into subgroups 52 of the local genotypes were included in Ganja-2 and 54 Ganja-7 subgroups. 55 Ganja-8 for the III group and 51 Ganja-4 Ganja for the V group. The location of these genotypes in separate clusters indicates that their genetic structure is different and independent from others. As the results show, genetically distant genotypes located in separate clusters can be grouped, evaluated and used to obtain high results in breeding programs.

Table 2. Correlation relationships between phenological indicators of durum wheat

	Plant height	Spike lenght	Length of main spike	Number of grains per spike	Weight of grains per spike	1000grain weight
Plant height	I	5,920210**	0,005019*	0,19552	0,040213	0,83081
Spike lenght	0,71978**	I	0,046104	0,49419*	0,2372	0,26732
Length of main spike	0,37314	0,27011**	I	0,012624	0,10635	0,1785
Number of grains per spike	0,17723	0,094143*	0,33426	I	0,005093	0,91871**
Weight of grains per spike	0,27755	0,16205*	0,22012	0,37256**	I	0,52387
1000grain weight	-0,02948	0,15219	0,18409**	0,014084	-0,0878*	I

Note. * and** - reliable correlation coefficients at the 0.05 and 0.01 probability level

Correlation between phenological indicators was determined using the SPSS statistical package program (Table 2). As can be seen from the table, there is an inverse relationship between the height of the plant and 1000 grain weight, the mass of the grain in the main spike and 1000 grain weight, the height of the plant and the length of the spike and number of grains per spike and the mass of the grain in the main spike.

4. Conclusion

Thus, as a result of the research carried out in 2021-2022, genotypes with high morphological parameters were discovered and it is planned to create high-yielding new varieties from them both in the selection and to be used directly in farms. Research work on samples is continued.

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